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FACTORS INFLUENCING THE EFFICIENCY OF OPERATION OF LEMON PACKING-HOUSES

(A Preliminary Report)

by

J. M. Tinley and J. E. Hodges

March, 1942

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(A Preliminary Report)

by

J. M. Tinley [1] and J. E. Hodges [2]

INTRODUCTION

Reason and Purpose of the Study.-- During the second half of 1940 the San Fernando Lemon Association requested the College of Agriculture to undertake an analysis of their operating practices and costs with a view to exploring what possibility there was (if any) of reducing unit operating costs. About the same time the Berkeley Bank for Cooperatives indicated to the Giannini Foundation of Agricultural Economics that a comparative study of operating costs of lemon packing-houses would be of considerable value to the Bank. It was pointed out that because of variations in organization and accounting practices, the Bank was able to place very little reliance upon unit costs derived from operating statements of lemon packing-houses. Officials of the California Fruit Growers Exchange also strongly urged a comparative study and indicated that several other associations, in addition to the San Fernando Lemon Association, would be willing to cooperate in such a study, if undertaken.

A brief preliminary analysis indicated that acreage in lemons had been increasing for a number of years and with increased acreage there had been a marked expansion in output of lemons. (Table 1 and fig. 1.) As a large part of the acreage in 1940 was still nonbearing, the peak of expansion in lemon output had not yet been reached. Consumer demand, in spite of growing expenditures on the part of the lemon industry for advertising, had not increased to nearly the same extent as had production. Larger quantities of fresh fruit could only be marketed at lower prices. For a number of years the associations affiliated with the California Fruit Growers Exchange had diverted lower grades of lemons to by-products uses and in this way had somewhat relieved the pressure of supply on prices. With the growing volume of output, larger and larger proportions of each year's crop had to be absorbed in by-products in order to prevent the complete collapse of the price structure for fresh lemons. As lemons diverted to by-products generally brought in a return considerably lower than that obtained from the sale of fresh fruit, the net returns to producers had shown a persistent tendency to decline. Moreover, since the peak volume of output will not be reached for several years, it is to be expected, in the absence of any marked and unlikely increase in demand, that prices of fresh fruit and net returns to producers will decline still further.

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[2] Associate in Agricultural Economics.

TABLE 1

California Lemon Acreage and Production, 1915-16 to 1940-41

Crop year	Bearing acreage 1 acres	Per cent bearing 2 per cent	Non-bearing acreage 3 acres	Per cent increase in non-bearing acreage 4 per cent	Per cent non-bearing 5 per cent	Total acreage 6 acres	Production 7 1,000 packed boxes
1915-16	20,453	52.9	18,228	---	47.1	38,681	2,901
1916-17	21,946	54.2	18,573	101.9	45.8	40,519	3,210
1917-18	22,651	57.4	16,799	90.4	42.6	39,450	2,683
1918-19	26,744	63.6	15,297	91.1	36.4	42,041	4,446
1919-20	36,060	78.7	9,769	63.9	21.3	45,829	4,532
1920-21	40,937	80.6	9,864	101.0	19.4	50,801	5,641
1921-22	42,266	80.9	9,958	101.0	19.1	52,224	4,377
1922-23	42,528	83.9	8,166	82.0	16.1	50,694	3,783
1923-24	43,021	84.4	7,939	97.2	15.6	50,960	6,432
1924-25	43,215	84.9	7,712	97.1	15.1	50,927	5,301
1925-26	44,270	89.1	5,418	70.3	10.9	49,688	7,317
1926-27	43,816	95.3	2,165	40.0	4.7	45,981	6,861
1927-28	41,475	96.0	1,743	80.5	4.0	43,218	5,419
1928-29	41,385	94.1	2,593	148.8	5.9	43,978	7,620
1929-30	41,036	91.0	4,079	157.3	9.0	45,115	6,109
1930-31	41,262	90.8	4,194	102.8	9.2	45,456	7,950
1931-32	41,679	89.1	5,077	121.1	10.9	46,756	7,696
1932-33	41,449	84.4	7,653	150.7	15.6	49,102	6,704
1933-34	40,746	81.7	9,114	119.1	18.3	49,860	7,295
1934-35	41,451	80.6	9,953	109.2	19.4	51,404	10,747
1935-36	40,600	71.7	16,050	161.3	28.3	56,650	7,787
1936-37	42,756	69.9	18,422	114.8	30.1	61,178	7,579
1937-38	47,089	74.3	16,250	88.2	25.7	63,339	9,304
1938-39	51,501	77.7	14,756	90.8	22.3	66,257	11,106
1939-40	55,230	79.7	14,076	95.4	20.3	69,306	11,983
1940-41	54,058		14,632	103.9		68,690	13,588*

* Indicated as of March 1, 1941.

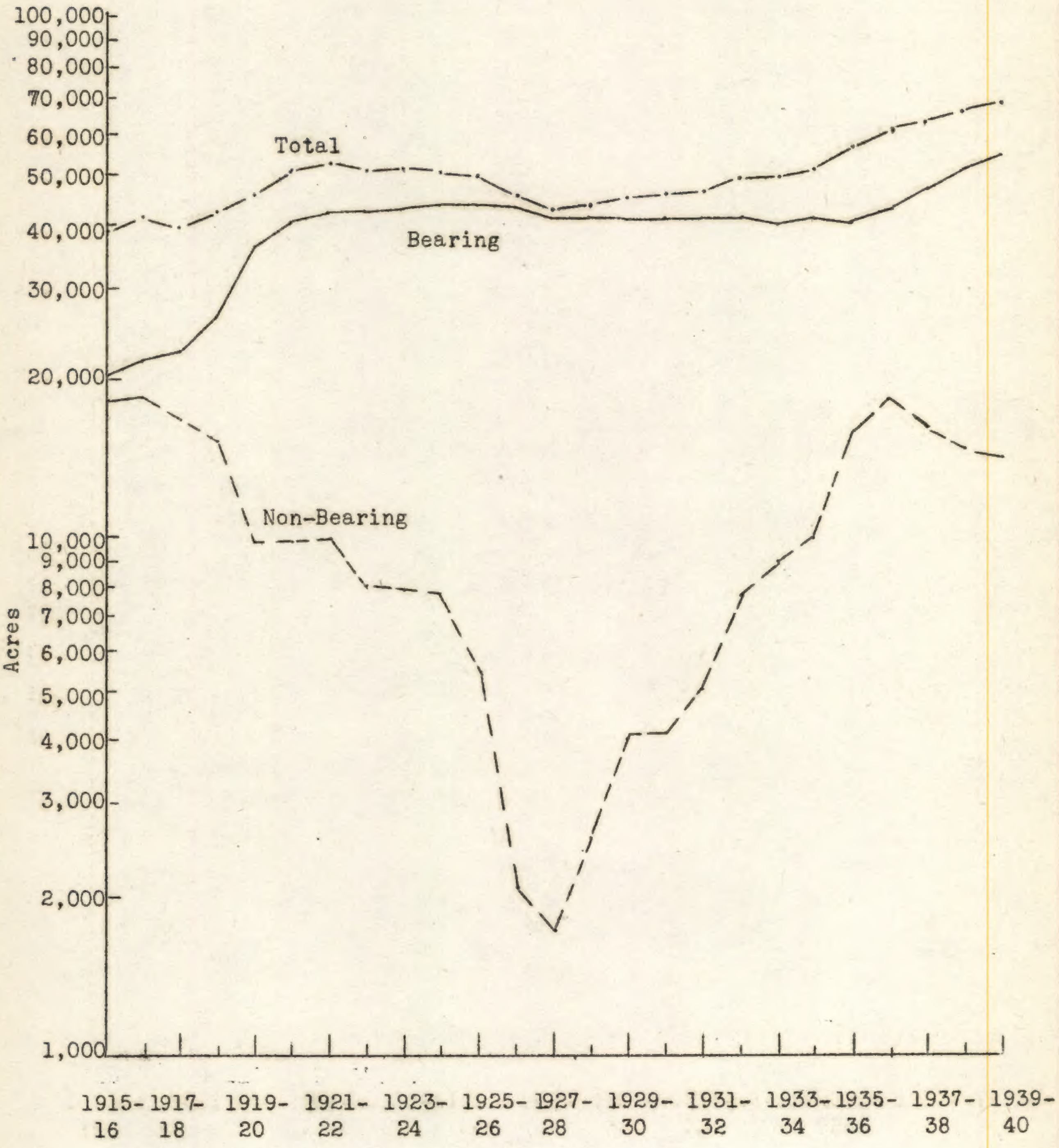
Sources of data:

Cols. 1,3,6, and 7: Compiled by California Fruit Growers Exchange from U. S. Dept. Agr. California Cooperative Crop Reporting Service, correspondence.

Cols. 2 and 5: Figures in cols. 1 and 3, respectively, divided by corresponding figures in col. 6 times 100.

Col. 4: Figures in col. 3 divided by nonbearing acreage of preceding year.

Fig. 1.-- Bearing, Non-bearing, and Total Lemon Acreage in California, 1915-16 to 1939-40
Source: Table 1



Under the circumstances, lemon producers are vitally interested in discovering ways and means to increase net returns on their fruit and to reduce operating costs. Increased expenditures on advertising and consumer education may aid in raising or at least preventing any further marked decline in prices paid by consumers. However, the effectiveness of advertising in raising or maintaining prices of fresh lemons, in the face of a growing volume to be marketed, is likely to be somewhat limited.

Somewhat more promising (at least in certain directions) is the possibility of reducing operating costs incurred while the product is in transit from the producer to the consumer. The California Fruit Growers Association has for a number of years analyzed the division of the consumer's dollar spent for lemons and from these data has calculated the proportion received by the producer. (Table 2.) In 1938-39 the average price per box of lemons paid by consumers was $7.010. The jobber's and retailer's margins absorbed $2.620, or 37.4 per cent of the price paid by consumers; transportation, $1.173 a box, or 16.7 per cent. These three items, over which growers individually or collectively have very little influence, thus absorbed just over half of the amount paid by consumers -- 54.1 per cent, to be exact. Selling and advertising costs amounted to $0.175 a box, or only 2.5 per cent of the amount paid by the consumer. This amount is small and in all probability cannot be reduced greatly. Even if selling and advertising costs could be reduced, this would not materially enhance the net returns to producers. Packing costs accounted for $0.814, or 11.6 per cent of the amount paid by consumers, and picking and hauling costs $0.370, or 5.3 per cent. The net return (on the tree) to producers was $1.88 a box, or just over one fourth of the amount paid by consumers. The situation for 1940-41 was not greatly different, except that the jobber's and especially the retailer's margins had increased, whereas the transportation and selling and advertising expenses had been reduced slightly. The result was a somewhat lower net return in 1939-40 than in 1938-39, although the average price paid by consumers per box was 3 cents higher in the later year.

It would seem that the greatest possibility for reducing marketing costs -- or the spread between the producer and consumer -- is in lowering picking and hauling and packing costs. As packing costs average more than double those for picking and hauling, increased efficiency in packing operations would tend to enhance net returns to growers to a greater extent than would a proportional increase in the efficiency of picking and hauling costs. Both these groups of costs are to some extent under the direct control of producers as these services are rendered on a cooperative basis.

Because of the importance to lemon producers of the possibility of increasing net returns by reducing, wherever possible, marketing costs, the Giannini Foundation of Agricultural Economics agreed to undertake the requested study of packing-house operations. It was deemed advisable, at least for the time being, to confine the study to packing-house operations only (a) because packing-house costs were of relatively greater importance, and (b) because somewhat different factors were involved in picking and hauling costs.

In determining the nature and scope of such a study of packing-house operations, it was found that there were considerable variations in the organization and range of activities undertaken by various houses. Some houses handled lemons only, others lemons in combination with oranges or grapefruit. Some houses confined their operations largely to picking and packing of fruit; others performed various other functions such as operating labor camps, ice making, and

TABLE 2

Division of the Consumer's Dollar Spent for Lemons

	1938-39		1939-40*	
	Dollars per box†	Per cent	Dollars per box †	Per cent
Fruit on tree	1.858	26.5	1.804	25.6
Picking and hauling	.370	5.3	.370	5.2
Packing	.814	11.6	.814	11.6
Selling and advertising	.175	2.5	.166	2.4
Transportation and refrigeration	1.173	16.7	1.146	16.3
Jobber's margin	.410	5.9	.440	6.2
Retailer's margin	2.210	31.5	2.300	32.7
Consumer pays	7.010	100.0	7.040	100.0

* Preliminary.

† Prices relate to packed fruit only and do not take into account loose fruit, export, or government sales and therefore do not represent average prices realized from all sales.

Source of data:

Annual Report of the General Manager, California Fruit Growers Exchange, October 31, 1940.

so on. Furthermore, it also appeared that there were many regional differences which affected not only the quality of the fruit received and the season of peak receipts, but also the cost of operation (especially storage operations) of individual plants. There were also considerable variations in the volume of fruit handled by different houses and in storage and handling policies.

In view of all these variable factors and also in order that the investigators could obtain a better understanding of the range and importance of operating practices, . it was decided to make a preliminary test study of a limited number of packing-houses. Seven of the eight [3] houses were members of the California Fruit Growers Exchange, and the eighth house was a member of the Mutual Orange Distributors Association. The seven houses associated with the California Fruit Growers Exchange were selected after consultation with officials of the Exchange. The eighth house volunteered to participate in the study. In making the selections care was taken to include large, medium, and small houses, to include combination [4] and straight lemon houses, and also to ensure that the more important lemon-growing areas of the state were adequately represented.

It was considered that the preliminary study of the packing-house operations of the eight lemon associations would constitute the basis for a later more extensive analysis of the operations of a large number of houses; that the preliminary study would bring into relief the relative importance of various factors affecting operating efficiency as well as indicate fruitful and time-saving methods of collecting and analyzing the vast amount of quantitative data available.

Sources and Types of Data Collected.-- The data on which this report is based were obtained from eight lemon packing-houses in southern California. These eight houses were selected on the basis of size, location, and willingness of the management to cooperate with the University to the extent of making records of every description available for analysis. On the average, two weeks were required to obtain the information needed from each house. The following outline of data collected is presented to show the scope of the investigation:

(1) Physical data: floor plan and space used for various operations, types of machinery, methods of handling and treating fruit, employee relations, services performed for grower members, volume of fruit handled and its disposition.

(2) Financial data: sources of fixed and working capital, voting control, pooling system, policy of making advances to growers.

(3) Balance sheet analysis: contents of all accounts with emphasis on the contents of fixed asset and depreciation reserve accounts.

(4) Expense analysis: contents of all expense accounts and data needed for segregating costs by departments.

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[3] These were: The San Fernando Lemon Association, the Briggs Lemon Association, the Carpinteria Lemon Association, the Glendora Lemon Association, the College Heights Orange and Lemon Association, the North Whittier Heights Citrus Association, the Escondido Lemon Association, and the Chula Vista Mutual Lemon Association.

[4] A combination house is one in which lemons and some other citrus fruit are handled; a straight lemon house is one in which only lemons are handled.

(5) Income and retain analysis: income and retains by size and grade of fruit.

In addition to data collected from the records of the various packing houses, information was also obtained from the district and central selling organizations with which the houses are affiliated, the Citrus League, the Berkeley Bank for Cooperatives, and the farm advisors of the various counties.

A study of this type should be based upon a large, representative sample of plants and should present an analysis of operating costs over a period of years. Due to difficulties encountered in collecting satisfactory data, it has been necessary to limit the study in the beginning to eight houses and to concentrate on the 1939-40 season. It must, therefore, be emphasized that this report is largely devoted to a consideration of the difficulties which obstruct an analysis of this type. Numerical data are presented merely as illustrative material and must not be interpreted as being representative of costs and returns for the industry as a whole. Likewise, accounting practices followed in the eight houses are not necessarily typical of practices in other associations.

METHOD OF ANALYSIS

The Problem of Measuring Plant Operating Efficiency.-- A complete study of the operating efficiency of lemon packing-houses requires the analysis of (1) the efficiency of operation of individual packing plants, (2) the relationship of the capacity of all plants in a given area to present and potential production of lemons in that area, and (3) the location of orchards with respect to existing packing facilities and the degree of overlapping of hauling routes.

Problems connected with the efficiency of operation of individual packing plants may be termed problems of internal plant efficiency. These are problems of managerial efficiency, plant layout or organization, degree of utilization of floor space and storage capacity, and the price of labor and materials. The relationship of the capacity of all plants to the supply of lemons and to hauling distances is a problem of external or industry efficiency. Long-run plans for the industry must be based upon a consideration of the savings to be realized in areas where plant facilities are inadequate or have been needlessly duplicated and where hauling routes overlap. It is proposed in this phase of the study to consider only those factors which influence internal plant efficiency, leaving the problem of industry efficiency for a later study.

Theoretically the best measure of internal plant operating efficiency is that based upon net returns (gross value less operating costs). Most business concerns, especially those having some control over their volume of output and enjoying a partially sheltered market, would aim at pushing their sales to a point where net profits or returns are maximized. The volume to insure maximum net returns may be greater or less than the volume that will insure the lowest unit operating costs.

In the case of the lemon industry, individual houses are able to exercise only a limited degree of control over the volume of fruit received from member-producers and also only a limited control over the general level of prices that will prevail in any one year for fruit sold fresh or diverted to by-products uses. Control is also limited over the relative volume of fruit thatwill be sold fresh or as by-products. Further limitations arise from the fact that yearly and seasonal weather conditions may affect both the volume and quality of fruit

received from producers and also the volume and prices of lemons sold. In other words, the gross returns obtained by individual houses can be influenced to only a limited extent in any one year by selling policies of such houses.[5]

Engineers are accustomed to measure efficiency on the basis of input-output ratios or output per unit of input. Such an analysis is also valuable to economists. It is possible to judge the efficiency of operation by ascertaining the ratio of man-hours, fuel power, and so on, to the number of units handled or produced. The input-output analysis alone is of somewhat limited value as a basis of measurement of economic efficiency because of the possibility of substituting one cost factor for another (wholly or partially). For example, machines can be substituted for hand labor, or one type of fuel for another. The basis of decision is usually the cost per unit of one competing input factor as compared with that of another input factor. Unit operating costs (ratios of costs of input factors to units of product handled) afford one of the best measures of operating efficiency. It is this measure that is used as a basis for determining the factors influencing the efficiency of operation of lemon packing-houses. Certain variations in unit operating costs, however, can be explained only in terms of variations in physical input-output ratios. For this reason both the unit cost and the physical input-output ratios will be used as a measure of operating efficiency.

The unit cost of operation of lemon packing-houses is likely to be influenced by numerous factors such as the volume of product handled, the per cent of capacity utilized, the quality and cost of labor, the size and quality of fruit received, the operating policies of the house, the location of the house, the cost of capital, and finally the efficiency of the manager in combining the various input cost factors. For a study of this nature to have greatest value, it is necessary wherever possible to isolate the influence of the various factors that affect unit operating costs or to determine the relative importance of such factors as a causal factor in unit costs.

Needless to say, because of the small number of houses included in the preliminary study and the wide divergence of volume handled and operating conditions, only very general and tentative conclusions could be drawn from the analysis of operating costs. In order to permit of a more detailed analysis of the cost of performing the various functions included under packing-house operations, it was deemed desirable to departmentalize operating costs. Such a departmentalization of costs on a functional basis facilitates the determination of reasons for variations of costs as between houses. After consultation with packing-house managers and accountants of individual packing-houses and after a careful analysis of packing-house operations, it was decided that there were four main and separable functions: (1) receiving and washing of fruit; (2) storing of fruit; (3) grading of fruit out of storage; and (4) packing.

Physical or cost ratios computed for a single plant for a single year have little value. They acquire meaning only when it is possible to compare the results for a large number of plants over a period of years. It is for this reason that so much attention has been devoted to the study of accounting systems

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[5] This is especially true since the introduction of the lemon prorate. Differences in the quality and attractiveness of packed fruit shipped by individual houses tend to establish definite trade preferences for fruit of this or that house. These differences once established tend to persist over a period of time and do not (except for unusual circumstances) vary greatly from year to year.

used by the several houses and the exact nature of all items charged to various expense accounts. Reliable comparisons cannot be made unless all the houses follow a uniform system of cost classification consistently over a period of years. 6/

But even where uniform accounting methods are used, unit costs are inadequate as measures of operating efficiency if the prices of the cost factors vary from time to time or if they vary from one locality to another. Labor in one packing-house may be just as efficient as labor in a packing-house of the same size in another locality; but if the prevailing wage rates in the two localities are different, unit labor costs will be different for the two houses. Unit operating costs alone are, therefore, not sufficient, and they must be supplemented by physical input-output ratios wherever possible. Unfortunately the physical data required for such ratios are generally not available, and until such data are available, it will be impossible to make accurate comparisons of efficiency or to determine the optimum size for a lemon packing-house.

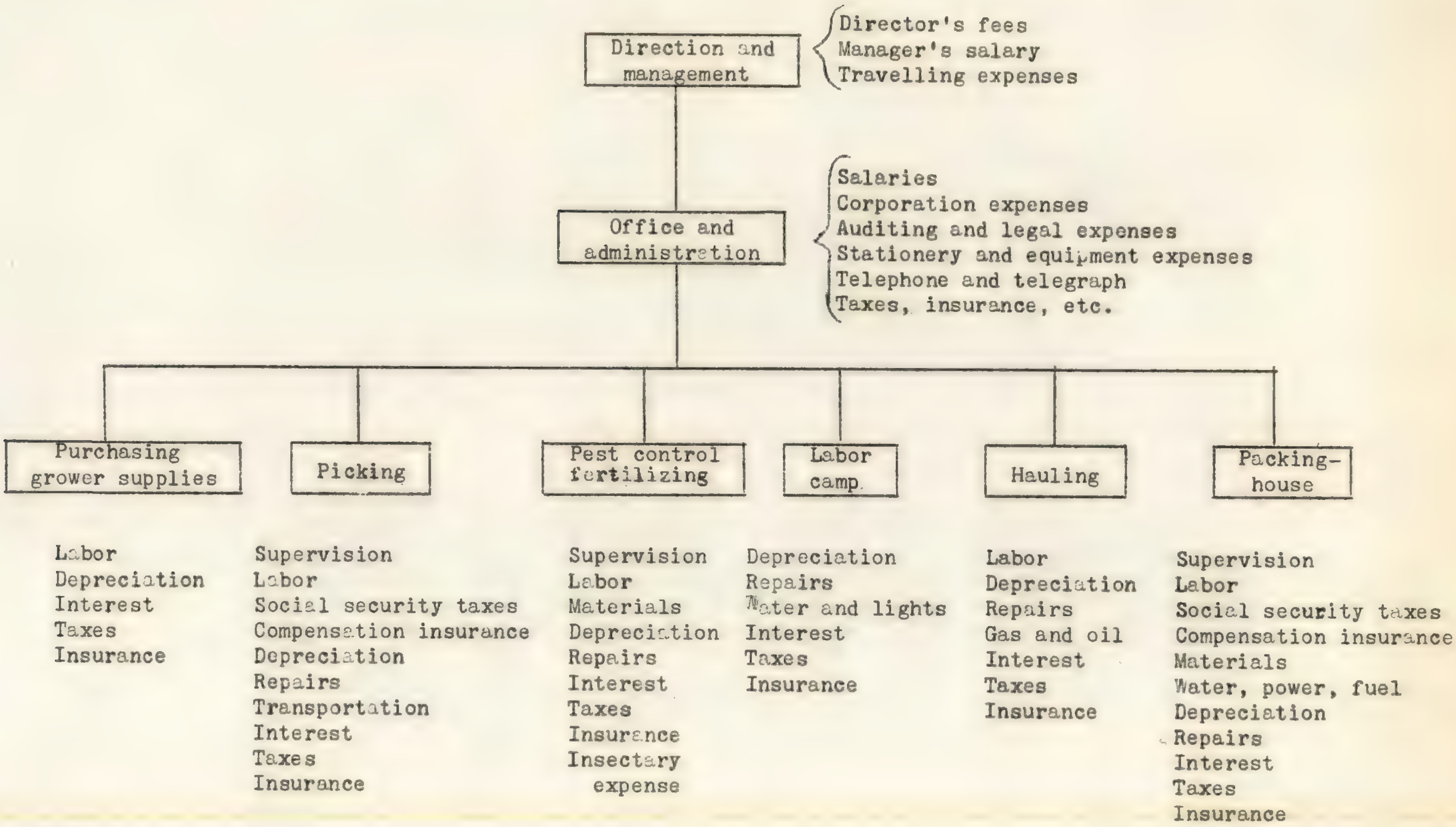
Interpretation of Ratios.-- Ratio analysis has always been subject to the criticism that there are no standards which can be used as guides in evaluating results. Averages of ratios based upon comparable accounting data gathered from a number of representative plants provide results which may be considered typical only in a restricted sense. Computation of unit physical and cost ratios removes the effect of the volume of fruit handled upon total operating costs of various kinds in so far as this is possible. Physical input-output ratios have the added advantage of permitting comparisons free from differences in the price of factors over a period of time or between localities. But even after due allowance for volume and cost of productive factors has been made, the resulting ratios are not unequivocal measures of efficiency. Small sizes and low quality of fruit will have a tendency to increase operating costs, and higher unit costs can be justified only if the additional care and expense result in a corresponding increase in net returns to the growers. It follows that results obtained by ratio analysis must be supported by knowledge of many factors influencing operating efficiency which are not subject to precise quantitative measurement.

Services Performed by Associations for Their Members.-- Associations included in this study perform a variety of services in addition to the actual processing of fruit within the packing-house. Figure 2 shows the more important types of services which are undertaken by some or all of the houses for the benefit of their members. This is not an organization chart of the usual type but is designed to show the variety of services performed and the costs incurred in connection with each.

(1) Purchasing grower supplies: All associations were found to buy production supplies for their members, such as fertilizer, heater oil, fumigation supplies, and covercrop seed. Some associations also purchase consumer goods for the personal use of the grower and his family. Most associations maintain inventories of fertilizer and heater oil for immediate delivery, and purchases and sales of such supplies are usually recorded in the accounts. However, invoices for goods and supplies not carried as inventories are usually charged direct to growers, and complete records of the volume of such purchases are generally not available.

6/ It is hardly necessary to add that comparisons based upon unit costs presented in the printed annual statements of packing-houses are unreliable. The same is true of unit returns to growers. A large part of this report will be devoted to a consideration of the effect on costs and returns of the widely different accounting practices used by the various houses.

Fig. 2.-- Operations and Expenses of a Lemon Packing-House



[illegible]

Not all members avail themselves of this service to the same extent, and the packing-house obviously incurs considerable expense in handling purchases for such growers. Several associations were found to have warehouses and oil tanks for the storage of supply inventories. Depreciation on these warehouses and oil tanks, interest on investment in plant and average inventories, property taxes,insurance, labor in the warehouse, and other direct expenses should be borne by the growers who are benefited. Interest on trade acceptances used to purchase grower supplies should be prorated to the growers who buy supplies through the packing-house and should not be included in the regular interest expense account. A reasonable proportion of office expense should likewise be included in the amount charged to growers. Only one association included in this study segregates these expenses satisfactorily.

(2) Picking: All associations were found to provide supervision, picking crews, and picking equipment required for picking their members' fruit. Direct picking labor and social security taxes on picking pay rolls are correctly charged by the associations to individual growers. Most associations likewise segregate overhead items such as picking supervision, compensation insurance, depreciation and repairs on picking equipment, insurance on field equipment, and field transportation expense, and an additional charge is usually levied against each grower to compensate for these expenses. The balance of picking expenses not covered by this charge for picking overhead is commonly charged against the packing retain for the season. Only one association attempts to allocate a part of office and administrative expense to picking, and this allocation is not complete.

(3) Pest control, fertilizing, and other field work: The extent to which associations perform this work for their members varies considerably. Growers must, of course, purchase all materials and supplies used in their orchards, and some associations limit their participation in this work to purchasing supplies which their growers need. Some associations actively supervise pest control work and fertilizing done in the orchards of their members. In such cases the association is likely to own its own sprayers, fumigation tents, and miscellaneous equipment required for the work. The cost of supervision, depreciation, repairs, interest, and taxes on equipment, and overhead are expenses incurred in providing this service and should be carefully segregated from the regular expense accounts.

(4) Labor camp: Five of the associations were found to own and operate labor camps so as to provide accommodations for field workers and their families. Depreciation and repairs, utilities, property taxes, insurance, and interest on investment are typical expenses which should be charged against the rent received from the camps. An excess of operating expenses over income may properly be considered as a part of picking expense provided the camp is used to accommodate field workers only.

(5) Hauling: Most growers were found to haul their own fruit to the packing-house or else hire commercial trucks for this work. Where a commercial truck is used, the packing-house usually handles the bookkeeping for such transactions. This work, of course, entails additional office expense, but only one association assesses a handling charge to cover this expense. One association maintains its own trucks for hauling members' fruit at rates which vary with the distance of the orchards from the packing-house. Labor, depreciation, and repairs on trucks, oil and gasoline, taxes, insurance, and interest on investment are expenses which should be charged against income from this operation.

(6) Processing fruit: The most important service performed by the association for their members is processing the fruit within the packing-house and

packing it for shipment. The present study is primarily concerned with the nature and amount of these costs; but because the scope of the analysis has been so restricted, it is not intended to give an implied approval to the custom of charging all overhead and much of the direct cost of other operations against the packing-house.

Method of Handling Interest Expense.-- True economic costs should include an allowance for interest on members' investment in addition to actual interest paid for borrowed funds. In a cost study of cooperative packing associations, this would mean that interest on members' equities (that is, revolving fund credits) would be computed at some arbitrary rate and treated as a part of operating costs. Although this imputed expense does not represent an actual cash outlay by the packing-house, it is, nevertheless, a cost for the growers if we assume that the money invested in packing-house facilities could earn the assumed rate of return if invested elsewhere.

On the other hand, it may be said that actual interest expense and imputed interest expense are financial items and should be entirely excluded from operating expenses when trying to measure plant efficiency. In this study, actual interest expense has been retained as a part of operating overhead, but interest on revolving fund credits has not been included. Aside from any theoretical reasons why imputed interest should or should not be considered, the impairment of grower equities by incorrect depreciation methods and different policies of financing operations by means of revolving funds and various types of reserves would render imputed interest meaningless.

Preliminary Expense Adjustments.-- Costs should be classified in the accounts of a packing-house according to the various classes of services performed for members by the corporate entity. Most houses attempt to segregate picking and labor camp expenses from regular packing-house expenses, but these segregations and the corresponding subclassifications are never complete or uniform. It was therefore necessary to make a detailed examination of the contents of every expense account. On the basis of information derived from this study, all direct expenses were reclassified according to (1) the service or operation in connection with which the expenses were incurred (for example, purchasing, picking, packing-house, etc.), and (2) the exact nature of the expense (for example, labor, pay roll taxes, compensation insurance, fire insurance, property taxes, depreciation on building, depreciation on equipment, etc.). The purpose of these adjustments was to make all expense classifications comparable both horizontally and vertically.

The variety of items thrown together in the insurance expense account provides a good illustration of the need for reclassification. A typical insurance expense account will include (before adjustment) such diverse charges as:

(1) Premiums on bonds carried on manager and bookkeeper.

(2) Premiums for fire insurance on the packing-house building and equipment, fruit held in storage, picking equipment, warehouse, and heater-oil storage tanks.

(3) Premiums for public liability and property damage insurance on automobiles and trucks owned by the association.

(4) Premiums on public liability insurance policies carried to protect the house from liability to individuals injured in the packing-house or in the field.

(5) Premiums on compensation insurance required by state law to compensate house and field employees in case of accident.

(6) Premiums on group insurance policies carried for the benefit of employees.

(7) Social security taxes on house and field pay rolls.

It should be obvious that departmentalization of operating costs and the calculation of unit costs could not be undertaken until the contents of such mixed accounts were reduced to their basic elements.

In the majority of cases, the method of accounting for depreciation and repairs was found to be unsatisfactory, and it was necessary to make important adjustments for these expenses. It was found that some associations had, for a number of years, charged repairs to fixed asset accounts. This means that current repair expense is too low and the annual depreciation expense will be too high in future years. All charges to fixed asset accounts were examined, and repairs which had been "capitalized" were removed from the asset accounts so that the remaining balances represented the original cost of buildings and equipment.[7]

Six of the eight houses correctly compute their annual depreciation expense on the basis of the estimated useful life of their buildings and equipment. These estimates differ between houses partly because of different managerial policies with respect to replacement and repairs and partly because no systematic study has ever been made to determine the average useful life of various classes of equipment and types of building construction. A uniform schedule of depreciation rates was, therefore, adopted for this study based upon the estimated useful life of buildings and various types of equipment (see table 3). These rates were established for the sole purpose of computing depreciation expense on a uniform basis for this analysis. It is not recommended that these particular rates be adopted by the industry although it would certainly be desirable if some uniformity in depreciation rates could be achieved.

Two associations make no attempt to base their calculations of depreciation expense upon the estimated life of their fixed assets. One of these houses computes total depreciation expense at the rate of 5 cents per packed box and credits reserves for depreciation for arbitrary amounts. The other house merely charges an arbitrary amount for depreciation against the packing retain. In both cases, adjustments were necessary to make the charges for depreciation comparable with the other houses.

In several of the houses it was found that repairs were being charged to the reserves for depreciation. Adjustments were made to remove these charges from the depreciation reserves and include them with operating expenses.

A very important type of adjustment was necessary in nearly every case where the packing-house levies a handling charge against by-products fruit. The amount of this handling charge is usually debited against the expected returns from by-products and credited to the packing-house labor expense account. If the amount involved is large, this practice materially reduces labor expense and understates the actual operating cost. The handling charge on by-products fruit is of the same nature as the packing retains levied on packed and loose fruit and should be handled in the same way in the accounts. The adjusting entry therefore takes the form of a debit to the labor expense account and a credit to an account entitled "Retain on By-Products Fruit" or "Handling Charge for By-Products Fruit."

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[7] Only the cost of new buildings and equipment and improvements or additions to existing buildings and equipment which have a service life greater than one year should be capitalized and depreciated annually.

TABLE 3

Uniform Depreciation Rates* Used in Calculating Depreciation Expense for Lemon Packing-Houses

Items	Per cent
Air and refrigeration equipment	10
Automobiles and trucks	25
Box sheds	3
Garages	5
Heater-oil storage tanks	5
Labor camp buildings	3
Labor camp equipment	10
Office buildings	3
Office furniture and equipment	10
Packing-house buildings	3
Packing-house equipment including boilers, washing machines, grading units, box machines, and miscellaneous equipment	7
Paving, curbs, and drains	5
Picking boxes	20
Picking ladders	20
Picking trailers	10
Railroad spur track	3
Warehouses	3

* These are the rates most commonly used by lemon packing-houses.

[illegible]

[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
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[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

Most of the associations have a policy of charging certain types of expenses direct to returns on the sale of fruit. Royalties paid for the use of washing and waxing machines, descaling, local icing and hauling expenses, and fruit inspection costs are examples. Since this procedure understates both operating expenses and gross returns, adjustments had to be made to include these charges with regular operating expenses and increase gross returns by an equal amount.

The adjustments which have been outlined represent the more important changes made necessary because of incorrect accounting methods or lack of uniformity in the classification of expenses. Other adjustments of a minor nature were also made before it was possible to proceed with the departmentalization of operating expenses incurred in processing fruit with the packing-houses.

Preliminary Adjustments to Returns.-- Although this is a study of operating costs, it is necessary to give some consideration to the returns received by growers, Other things being equal, there is reason to believe that greater care in handling fruit (represented by higher packing costs) should be associated with greater gross returns. For present purposes, grower returns are defined as returns at the receiving door. Expenses for receiving, washing, grading, packing, carloading, transportation, and selling have all been deducted from the gross amount received for the sale of the fruit; but picking, hauling, and production costs have not been deducted.

It was pointed out in the preceding section that adjustments for operating expenses charged directly against returns affected expenses and returns alike. Preliminary adjustments for handling charges on by-products fruit also affect grower returns, but to secure uniformity in returns the handling charge must be completely eliminated. Where a handling charge is assessed, the by-products account is usually debited for the amount of the charge in advance of the receipt of any cash for this fruit. When the adjusting entry is made debiting the labor expense account and crediting "Retain on By-Products Fruit," unrealized returns for by-products fruit are thereby introduced. This alone is not undesirable, but difficulty arises because each of the five houses that made a handling charge for culls uses rates for computing this charge which vary from 4 to 20 cents per packed box. A handling charge on by-products is desirable as a matter of policy, and the incidence of packing-house costs is likely to be more equitable if such a charge is made. The amount of the charge, however, should not be allowed to affect either operating costs or total grower returns. For this reason, it was necessary to eliminate the amount of the handling charge from the total of retains and revenues for all associations.

The final adjustment for by-products consisted of estimating total returns for by-product fruit at $15 per ton. This was approximately the amount received for by-products in 1938-39.

Two of the three associations that make a special washing charge were found to debit individual grower accounts for the amount of the charge. The corresponding credits are subsequently included by these associations with packing-house retains and revenues. The net effect of this procedure is to take the amount of the charge away from members with one hand and return it with the other. Obviously the transaction should not be allowed to inflate the packing refund and thereby inflate total net grower returns. The amount of the washing charge in these two houses was therefore deducted from the returns from the sale of fruit in order to secure adjusted grower returns.

The same type of adjustment was necessary for two packing-houses that make direct charges to members for fire insurance reserves. The accounting procedure used by these two houses understated operating expenses and overstated returns. Adjustments were made to include the amount of the charge with operating expenses and a corresponding deduction was made from returns from the sale of fruit.

Departmentalization of Processing Costs.-- Operations in the typical lemon packing-house fall logically into four departments: (1) receiving and washing, (2) storing, (3) grading, and (4) packing and carloading. For purposes of cost analysis a fifth classification is needed for indirect costs or overhead. The detailed classification with subheadings is shown below.

I. Receiving and washing

a. Direct labor, social security taxes, and compensation insurance
b. Supervision
c. Direct materials
d. Water, light, power, and fuel
e. Property taxes
f. Fire insurance
g. Building repairs
h. Equipment repairs
i. Depreciation on building
j. Depreciation on equipment

II. Storing (includes refrigeration and air conditioning expense)

a. Direct labor, social security taxes, and compensation insurance
b. Supervision
c. Direct materials
d. Water, light, power, and fuel
e. Property taxes
f. Fire insurance
g. Building repairs
h. Equipment repairs
i. Depreciation on building
j. Depreciation on equipment

III. Grading

a. Direct labor, social security taxes, and compensation insurance
b. Supervision
c. Miscellaneous expenses (includes direct materials, depreciation on X-ray machine, etc.)

IV. Packing

a. Direct labor, social security taxes, and compensation insurance
b. Supervision
c. Direct materials
d. Water, light, power, and fuel
e. Property taxes
f. Fire insurance
g. Building repairs

IV. Packing (cont'd)

- h. Equipment repairs
- i. Depreciation on building
- j. Depreciation on equipment
- k. Waxing royalty
- l. Ice, hauling, and miscellaneous expenses

V. Overhead

- a. Office expense, including office salaries, social security taxes on office employees, property taxes, fire insurance, and depreciation on office equipment, telephone, and office supplies
- b. Interest paid
- c. All other expenses, including automobile and traveling expenses, donations to various organizations, maintenance of grounds, public liability insurance, miscellaneous supplies, auditing and legal expenses, and directors' fees

No house included in this survey kept its expenses on a departmental basis, and the classification of expenses under the five headings given above was accomplished by various methods depending upon data available. The following procedure is, however, typical of the allocations made for each of the eight houses.

Direct Expense Classifications for Receiving and Washing, Storing, Grading, and Packing Departments [8]

1. Labor: All associations keep direct picking and field labor separate from packing-house labor. A few associations divide total packing-house labor into two classes: (1) packing labor, and (2) general house labor. Where this classification is used, packing labor includes only the wages of the women actually engaged in wrapping and placing fruit in boxes for shipment. General house labor includes wages of all other employees, regardless of whether they are engaged in receiving, washing, storing, grading, carloading, or boxmaking. Only one house makes any attempt to go further than this and classify house labor according to the nature of the work performed. In seven of the eight houses it was therefore necessary to take sample pay rolls and with the help of the manager, house foreman, or bookkeeper determine as nearly as possible the

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[8] It is important to notice that the terms "direct expense" and "overhead" used in the discussion which follows do not correspond to orthodox accounting terminology. Strictly speaking, "direct expenses" are those which can be assigned directly to one of the operating departments. Shook, wraps, labels, etc., are the only expenses which were found to be segregated accurately enough so that they could be assigned to a department without having to resort to some type of allocation. Labor expense incurred in washing, storing, grading, or packing is "direct" by nature but allocation was necessary because pay rolls were not departmentalized by the houses. Manager's salary, pay-roll taxes, depreciation, repairs, property taxes, and fire insurance have likewise been classed as direct expenses in this discussion because there are logical bases available for allocating these items to one of the four departments. Contrary to usual accounting terminology, overhead includes only those expenses for which no logical bases of allocation are available other than the total of the direct expenses incurred in each department.

duties of each employee. The amounts earned by each employee were then classified by departments. Departmental labor costs for these sample periods were used to allocate general house labor to the four operating departments. This task was complicated by the fact that employees are likely to be shifted from one operation to another within a pay-roll period. The results of this analysis may, as a consequence, be subject to a wide margin of error.

2. Social security taxes and compensation insurance: These expenses were prorated to operating departments on the basis of total direct labor.

3. Manager's salary: Ten per cent of the manager's salary was arbitrarily charged to picking expense. The remaining 90 per cent was then combined with the house foreman's salary and the total prorated to operating departments on the basis of total direct labor.

4. Direct materials: Shook, wraps, labels, and nails are usually kept in separate accounts by the associations. These expenses could be assigned directly to packing operations without further analysis. Nearly all houses had a miscellaneous supply expense account which included washing, storing, and packing materials; if original invoices were readily available, items charged to this account were segregated by departments. Where this was not feasible, the beginning and final inventories were classified by departments, averaged, and the balance of the miscellaneous supply expense account prorated to operating departments on the basis of these averages.

5. Office salaries: Five per cent of office salary expense was arbitrarily charged to picking. The remaining 95 per cent was carried to packing-house overhead.

6. Water, light, power, and fuel: These expenses were prorated on the basis of estimates obtained from the manager and house foreman.

7. Depreciation expense: Depreciation on buildings was prorated to the operating departments on the basis of floor space occupied. Depreciation on equipment was prorated on the basis of the cost of equipment used in each department. Several of the associations maintain equipment ledgers which make it easy to classify the cost of equipment by departments. For those associations which do not maintain such records, it was necessary to analyze entries in the machinery and equipment accounts and segregate the cost items by departments.

8. Repair expense: Repairs to buildings were prorated to departments on the basis of floor space. Repairs to equipment were prorated on the basis of cost of equipment used in each department.

9. Taxes and fire insurance: These expenses were prorated on the basis of net capital invested in the various departments. Net capital invested in a given department includes a prorata share of the cost of land, building, equipment, inventories, etc., less reserves for depreciation.

Overhead

All expenses which could not be charged directly to a particular service or department or allocated on some logical basis were classified as packing-house overhead. Five per cent of office supplies and expense, office salaries, telephone and telegraph, contributions to various organizations, auditing and legal fees, and directors' fees, and 10 per cent of automobile and traveling expenses were

arbitrarily charged against picking; the remainder in each case was charged to packing-house overhead. Interest expense was divided between packing-house overhead, labor camp, and picking on the basis of net capital invested in plant, equipment, and inventories. The total of packing-house overhead was subsequently allocated to by-products, loose, and packed sales on the basis of total direct charges against each of these classes of fruit but was not included in computing unit departmental costs.

Allocation of Adjusted Departmental Costs to By-Products, Loose, and Packed Fruit.-- After packing-house expenses were departmentalized, the next step was to analyze expenses according to sales outlet. This analysis is entirely mechanical provided we know the volume of fruit handled in each department and sold through each outlet. The procedure is illustrated in table 8; the method of analyzing the physical flow of fruit through the packing-house is discussed in the next section.

Data Pertaining to Volume of Fruit Handled.-- In order to compute unit costs or classify expenses by sales outlet, it is necessary to have data pertaining to the volume of fruit handled in each department. Figure 3 shows the flow of fruit from the orchard through each of these departments to its final destination. Physical data concerning this flow of fruit required for cost accounting and managerial purposes may be tabulated as follows:

(1) Number of field boxes sent to the by-products plant direct from orchards.

(2) Number of field boxes received by the packing-house.

(3) Number of loose storage boxes taken direct from the sizer and sent to by-products plant.

(4) Number of loose storage boxes of washer culls taken from the sorting belts and sent to the by-products plant.

(5) Number of loose boxes put into storage rooms.

(6) Number of loose boxes taken from storage rooms and sent direct to by-products plant.

(7) Number of loose boxes taken from storage and put on grading belts.

(8) Number of loose boxes of grader culls taken from the grading belts and sent to by-products plant.

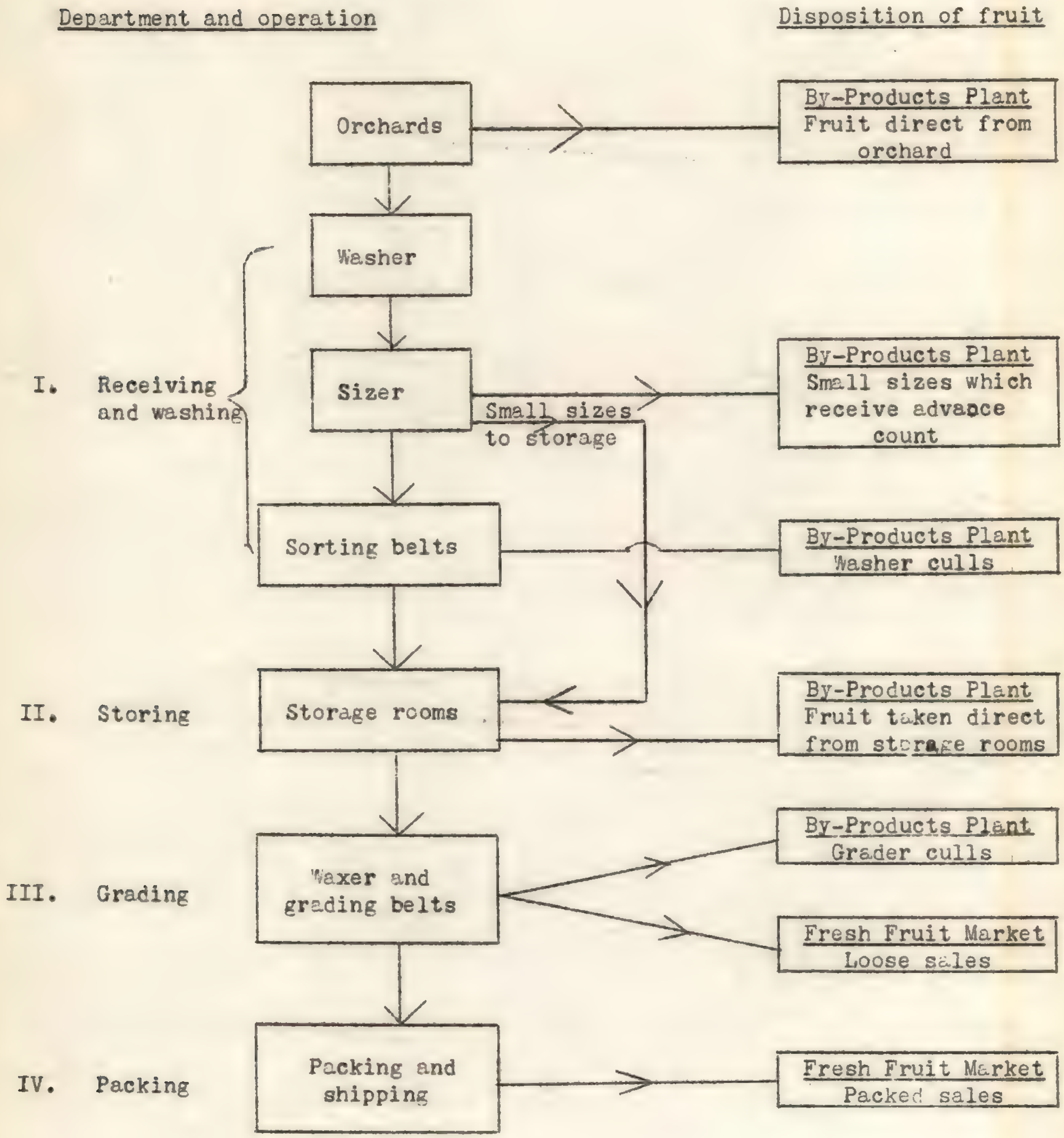
(9) Number of loose boxes sold locally and in Los Angeles at auction.

(10) Actual number of packed boxes sold.

(11) Quantity of fruit taken from the washer, storage rooms, and grading belts and dumped.

None of the houses included in this study was able to supply all of the data enumerated above. With the exception of minor details, operations in the eight houses are quite uniform but there is a great difference in the type and

Fig. 3.-- Flow of Fruit Through a Lemon Packing-House



accuracy of data which could be obtained concerning the flow of fruit. This situation seems to have arisen from the fact that the various associations have generally not realized that accurate accounting for the disposition of the fruit received by the house is just as important as accurate accounting for cash receipts and disbursements. Houses generally keep only those data which are needed in connection with their pooling systems. Aside from the fact that pooling systems now in use are probably inadequate and based upon insufficient data, it must be emphasized that complete and accurate data pertaining to the physical flow of fruit through the packing-house are needed regardless of the type of information that may or may not be needed for the pooling system. Information which the houses were generally able to provide will be discussed briefly.

(1) All associations were able to furnish data as to the number of field boxes received. This information, as well as other physical data supplied by the houses, is subject to the general limitations discussed below under the heading, "Accuracy of Units of Measurement."

(2) The associations were generally able to provide data pertaining to the total quantity of fruit sent to the by-products plant but the amounts were unreliable. In two associations some by-products fruit had been credited to growers and reported as packed fruit. These credits, sometimes called "pencil pack," were included with regular packed credits when fruit of the same quality as that actually packed had to be sent to the by-products plant. It is not intended to criticize the reasoning upon which this practice is based, but statistical records should be kept which clearly reflect the exact amount of fruit sent to by-products and the exact number of packed boxes and reports to members should show this information.

It was extremely difficult to determine what part of the total amount of fruit sent to by-products was eliminated at the washer and what part was eliminated at the grading belts. All associations make a record of the various grade, size, and color segregations which are made at the washer, but three associations had not attempted to tabulate the results in a usable form. For these houses it was necessary to go to the original washing records to obtain the data needed. Even this procedure failed to yield accurate results because washing records as now kept do not designate the exact amount of fruit sent direct to by-products. All that could be done was to take the total of those grades and sizes which the management indicated as being most probably sent to by-products. The data thus obtained are subject to considerable error because the policy of eliminating fruit at the washer varies from time to time.

(3) The associations were usually able to provide an estimate of the number of loose boxes of fruit sold. But two associations pool the returns from loose sales with the returns from by-products fruit and the amount of fruit sold loose is combined with the amount of fruit sent to by-products. In these houses some difficulty was encountered in separating the two amounts. It must again be stressed that regardless of the pooling system in use records should show exact quantities disposed of by each method of sale.

(4) Associations were generally able to provide accurate information as to the number of packed boxes sold. But, as already mentioned, this figure is occasionally distorted by the fact that "pencil pack" credits are included with the actual number of packed boxes.

Accuracy of Units of Measurement.-- Even where data are available, the units used for reporting the volume of fruit handled differ widely. Fruit received is generally reported in field boxes and fruit taken from the washer is reported in terms of loose boxes but the net weight of the contents varies considerably. Loose sales are usually reported in terms of packed boxes. By-products are reported in units of pounds and packed boxes. Total shipments are given in terms of pounds, packed boxes, and cars. All these variations caused little inconvenience where it was possible to obtain accurate conversion figures.

An important source of error lies in the policy with respect to the filling of boxes. Not only does the policy vary between houses, but it will vary within a given house from one time to another. Another difficulty arises from the fact that different associations are not using field boxes of the same size. Different sized containers or different policies of filling prevent accurate comparisons of unit costs or returns. But uniform containers and uniform policies of filling containers would not eliminate all the errors present in measurements based upon volume. Boxes filled with small sizes will tend to weigh more than boxes filled with large sizes. Fruit of the same size may have different juice content and therefore differ considerably in weight. These conditions cause inequities between growers within a given house and will also affect the accuracy of cost comparisons made between houses.

These variations introduce a wide margin of error into the physical data used as a basis for cost ratios computed in the subsequent analysis. Units were made as uniform as possible by computing conversion factors based upon estimated unit weights supplied by the managers of the various houses. These estimates are of course derived from long years of experience, but accuracy would be improved considerably if a consistent policy of taking test weights would be adopted by all houses.

Measurement of Shrinkage.-- A problem related to the accuracy of the units of measurement is the measurement of shrinkage that occurs while fruit is in the house. Managers of the houses investigated reported an estimated shrinkage varying from 0 to 10 per cent. In no case was a house found to have a consistent policy of weighing sample lots of fruit when placed in storage and when taken out of storage in order to determine the amount of weight shrinkage which had occurred. No association was able to provide accurate data as to the quantity of rots which had to be taken from the washer, storage rooms, or grading belts and dumped. Not only are such data necessary if the house is to account for all fruit received, but the amount of shrinkage which occurs is related to operating efficiency and these data are needed before a complete efficiency study can be made.

Analysis of Fixed and Variable Costs.-- The allocation of costs of by-products, loose, and packed fruit should be carried through in terms of fixed and variable costs. All costs may be considered variable before land is purchased and a packing-house built and equipped. Once physical facilities have been acquired, such expenses as supervision, taxes, depreciation, and various overhead expenses are fixed in the sense that the amount of the expense does not fluctuate appreciably with variations in the volume of fruit handled. Direct labor is, of course, the most important variable expense, and water, power, fuel, materials, etc., are variable within limits.

The distinction between fixed and variable costs is not always clear-cut, and the segregation of expensesinto these two categories must be largely arbitrary.

For example, not all labor is variable. There is a minimum labor force which would be required regardless of the volume of fruit. However, it is important that the distinction be made as accurately as possible so that we may draw conclusions with respect to savings which might be realized by sending fruit to the by-products plant from the orchards or the washer without incurring additional handling costs.

ILLUSTRATION OF ANALYSIS FOR A TYPICAL PACKING-HOUSE

Analysis of the Volume of Fruit Handled.-- Since the packing-houses were unable to supply complete statistical data pertaining to the physical flow of fruit, it was necessary to resort to certain simplifying assumptions and make crude estimates of the volume of fruit handled at various stages. Figure 4 is a simplified diagram of the flow of fruit through the typical packing-house. The number of standard field boxes handled or disposed of at each stage is shown in each rectangle. The amount of fruit handled at each of the four operating stages forms the base (100 per cent) for the computation of the percentages indicated at the side of each of the lines representing a movement of fruit to the next stage or outlet. /

To construct such a diagram for a given house it was first necessary to assume that all fruit received at the packing-house door was washed. With one minor exception this assumption conforms to the actual method of operation in each of the houses. [9] For purposes of illustration, let us assume that House X actually received and washed 526,680 field boxes, each box having a net content of 2,500 cubic inches. The first step was to convert the actual number of field boxes received into the number of standard field boxes received. The standard box was assumed to have a net content of 2,926 cubic inches. The conversion required was, therefore:

$$\frac{2,500}{2,926} \times 526,680 = 450,000 \text{ standard field boxes } [10]$$

The next step was to determine the quantity of fruit sent to by-products directly from the washer. Let us assume that in House X the washing records indicated that approximately 10 per cent of the fruit washed was sent to by-products. As it was not possible to determine the amount of fruit dumped at this stage, it was assumed that 45,000 s.f.b. (10 per cent) were sent to by-products from the washer and the remaining 405,000 s.f.b. (90 per cent) were placed in storage. There were also no records available showing quantities of fruit which might have been taken direct from storage and sent to by-products so it was assumed that the 405,000 s.f.b. placed in storage were graded.

In order to complete the chart it was necessary to work backward from various records to determine the segregation of fruit made at the grading belts. Assume that these data were available for House X:

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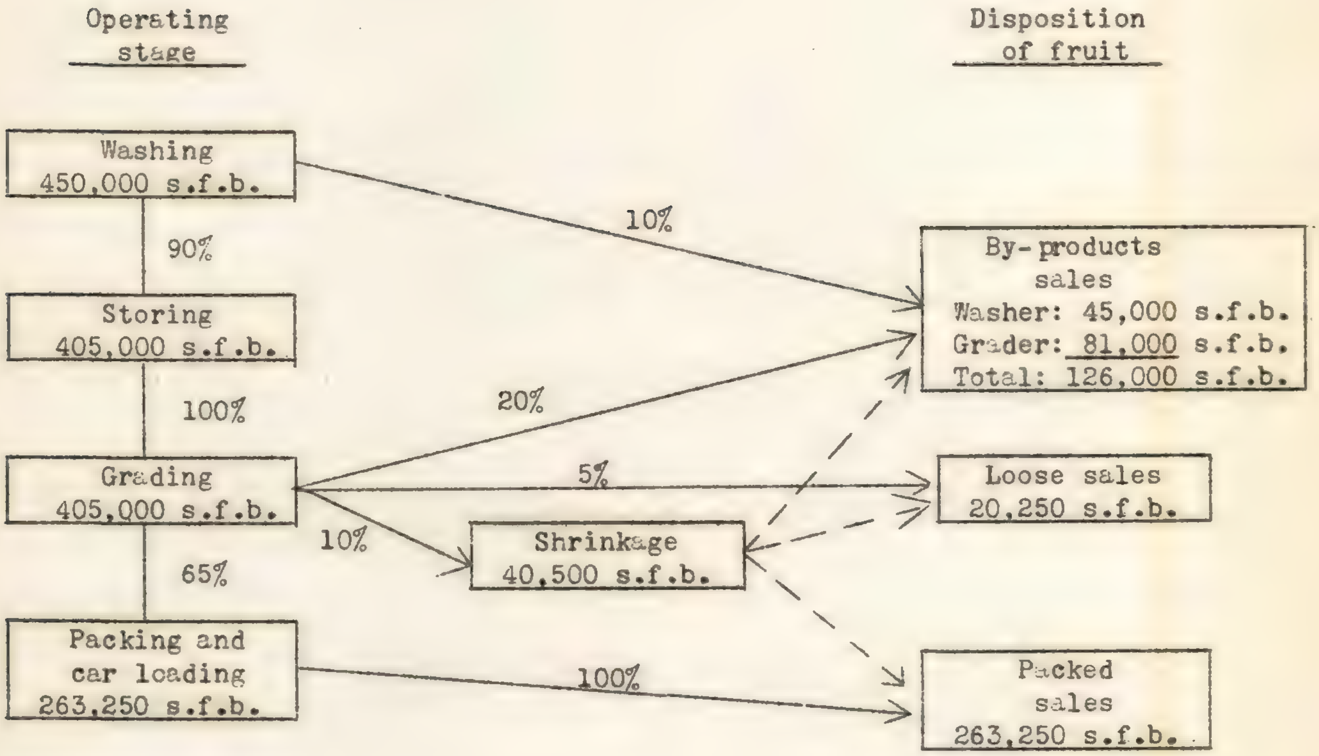
[9] This association carried a small quantity of fruit direct from the receiving door to storage while a washing machine was being remodeled.

[10] The phrase "standard field boxes" will hereafter be denoted by the letters "s.f.b."

Fig. 4.-- Simplified Diagram of Flow of Fruit through House X Used for Allocation of Costs to By-Products, Loose, and Packed Fruit



	Amount	Net unit weight
Total fruit picked	526,680 field boxes	50 pounds
Packed sales	192,568 packed boxes	80 pounds
Loose sales	18,232 loose boxes	65 pounds
By-products sales	3,686.75 tons	2,000 pounds

These amounts were then converted to standard field boxes as follows:

Total fruit picked: $\frac{526{,}680 \times 2{,}500}{2{,}926} =$ 450,000 s.f.b.

Packed sales: $\frac{192{,}568 \times 80 \times 2{,}500}{50 \times 2{,}926} =$ 263,250 s.f.b.

Loose sales: $\frac{18{,}232 \times 65 \times 2{,}500}{50 \times 2{,}926} =$ 20,250 s.f.b.

By-products sales: $\frac{3{,}686.75 \times 2{,}000 \times 2{,}500}{50 \times 2{,}926} =$ 126,000 s.f.b.

Total fruit accounted for: 409,500 s.f.b.

Shrinkage: 40,500 s.f.b.

It was now possible to fill in the remaining amount shown in figure 4. Out of a total of 126,000 standard field boxes sent to the by-products plant, 45,000 s.f.b. were taken from the washer; the remainder (81,000 s.f.b.) was assumed to be taken from the grading belts. By working backward in this manner, we were able to account for 409,500 s.f.b. out of the 450,000 s.f.b. received by the house. The difference of 40,500 s.f.b. is shown in the figure as shrinkage. It will, of course, be apparent that this is actually a balancing figure representing several different types of losses: (1) loss of weight and volume experienced gradually by all grades of fruit while in the house; (2) rots removed from the washer, storage rooms, and grading belts and dumped; (3) discrepancies which arise because of variations in the amount of fruit actually contained in the field boxes received and the loose and packed boxes disposed of and the corresponding inaccuracies involved in using average weights to convert these units to standard field boxes.

Preliminary Adjustments to Operating Expenses.-- Table 4 illustrates the more important types of preliminary adjustments which were necessary in order to obtain uniform expense classifications for the eight packing-houses. The numbers in parentheses in the adjustment columns correspond to the following notes which explain the nature and purpose of each adjustment.

(1) Debit: Waxing royalty $4,800
Credit: Adjustment balance $4,800

This adjustment was necessary because the royalty paid for waxing equipment had been charged by the association directly against returns from the sale of fruit. This results in an understatement of operating expenses and gross returns alike but does not affect net grower returns.

(2) Debit: Supervision -- foreman's salary $2,000
Credit: Packing-house labor $2,000

TABLE 4

House X. Preliminary Adjustments to Operating Expenses

1939-40

	Operating expenses per statement (debit)	Revenues per statement (credit)	Adjustments*		Adjusted expenses (debit)	Adjusted revenues (credit)
			(Debit)	(Credit)		
	Dollars					
Packing-house:						
Retains and revenue:						
Packing retains:						
192,568 packed boxes at $1.00		192,568				192,568
18,232 loose boxes at $0.25		4,558				4,558
Washing charge: 526,680 field boxes at $0.05		26,334				26,334
Selling refund		5,200				5,200
Supply company refund		3,100				3,100
Miscellaneous revenue		1,500				1,500
Handling charge on by-products fruit: 3,686.75 tons at $4.00				(3) 14,747		14,747
Insurance retain: 526,680 field boxes at $0.0025				(6) 1,317		1,317
Packing-house expenses:						
Shook	30,000				30,000	
Wraps	12,000				12,000	
Labels	700				700	
Other packing materials	2,200				2,200	
Miscellaneous house supplies	2,070				2,070	
Waxing royalty			(1) 4,800		4,800	
Supervision:						
Manager's salary	4,000				4,000	
Foreman's salary			(2) 2,000		2,000	
Packing-house labor	52,253		(3) 14,747	(2) 2,000 (4) 1,080	63,920	
Night watchman's salary			(4) 1,080		1,080	
Social security taxes	2,200				2,200	
Light and power	1,800				1,800	
Gas	800				800	
Water	300				300	
Building repairs	360				360	
Equipment repairs	600				600	
Depreciation on building	3,300		(5) 1,200		4,500	
Depreciation on house equipment	3,200		(5) 800		4,000	
Depreciation on office equipment	450				450	
Insurance	1,273		(6) 1,317	(7) 2,590		
Group insurance			(7) 275		275	

Public liability insurance			(7) 180		180	
Compensation insurance			(7) 500		500	
Fire insurance			(7) 1,357		1,357	
Bonds			(7) 100		100	
Property taxes	2,820				2,820	
Interest expense	2,000				2,000	
Office salaries	2,600				2,600	
Office supplies and expenses	400				400	
Telephone and telegraph	200				200	
Automobile and travel expenses	600				600	
Directors' fees	400				400	
Maintenance of grounds	200				200	
Other expenses (contributions, legal, and auditing)	800				800	
Total packing-house expenses and revenue	127,526	233,260			150,212	249,324
Other operations:						
Picking revenue:						
Direct charges to growers		85,500				85,500
Overhead charges (10% of direct charges)		8,550				8,550
Picking expenses:						
Supervision	2,800				2,800	
Direct picking labor	83,000				83,000	
Social security taxes	2,500				2,500	
Group insurance			(7) 25		25	
Compensation insurance	1,500				1,500	
Public liability insurance			(7) 100		100	
Supplies, repairs, and miscellaneous expenses	1,440				1,440	
Depreciation on equipment	800				800	
Fire insurance on equipment			(7) 8		8	
Automobile, truck, and trailer expense:						
Depreciation	300				300	
Repairs	75				75	
Gasoline and oil	100				100	
Transportation for pickers	2,500				2,500	
Labor camp expenses (excess of direct expenses over rent received)	1,475		(7) 25		1,500	
Total picking expenses and revenue	96,490	94,050			96,648	94,050
Amount adjustments carried forward			28,514	21,734		

(over)

Table 4 continued.

	Operating expenses per statement (debit)	Revenues per statement (credit)	Adjustments *		Adjusted expenses (debit)	Adjusted revenues (credit)
			(Debit)	(Credit)		
	Dollars					
Amount adjustments brought forward			28,514	21,734		
Warehouse expenses:						
Labor and social security taxes	1,700				1,700	
Truck expenses	200				200	
Depreciation on warehouse	260				260	
Fire insurance			(7) 20		20	
Total warehouse expenses	2,160				2,180	
Adjustment balance				(5) 2,000 (1) 4,800		
Total adjustments			28,534	28,534		

* Numbers in parentheses refer to explanations of adjustments shown in text, pp. 25 and 30.

This adjustment was made in order to change the classification of the packing-house foreman's salary from "house labor" to "supervision."

(3)	Debit: Packing-house labor	$14,747	
	Credit: Handling charge on by-products		$14,747

This entry was necessary because the packing-house had previously debited the by-products pool account and credited packing-house labor expense for the amount of the handling charge on by-products. This practice understates the actual labor expense. The amount of the handling charge is eliminated from gross returns in table 9.

(4)	Debit: Night watchman's salary	$1,080	
	Credit: Packing-house labor		$1,080

The night watchman's salary is an overhead expense; therefore this entry was made to remove this overhead expense from the direct labor account.

(5)	Debit: Depreciation on building	$1,200	
	Debit: Depreciation on house equipment	800	
	Credit: Adjustment balance		$2,000

An adjustment of this type was made for every association in order that all calculations of depreciation might be based upon the uniform rates in table 3.

(6)	Debit: Insurance expense	$1,317	
	Credit: Insurance retain		$1,317

This type of adjustment was necessary where the association had previously debited growers' accounts and credited an insurance reserve account for $1,317 (526,680 field boxes at $0.0025 per box) but had not included the total amount of the charge with operating expenses. The practice of charging this retain directly to growers rather than to returns results in an overstatement of grower returns, and the $1,317 is therefore shown as a deduction from returns in table 9.

(7) Debit:	Group insurance (packing-house)	$ 275	
	Public liability insurance (packing-house)	180	
	Compensation insurance (packing-house)	500	
	Fire insurance (packing-house)	1,357	
	Bonds (packing-house)	100	
	Group insurance (picking)	25	
	Public liability insurance (picking)	100	
	Fire insurance (picking)	8	
	Fire insurance (labor camp)	25	
	Fire insurance (warehouse)	20	
Credit:	Insurance expense		$2,590

This compound adjustment was made to split the insurance expense account into its basic elements in order to facilitate the allocation of this expense to operating departments.

Departmentalization of Adjusted Operating Expenses.-- Table 5 illustrates the procedure for classifying adjusted operating expenses by department and function. Packing expenses, such as shook, wrap, and labels; direct picking

TABLE 5

House X. Departmentalization of Adjusted Operating Expenses for 1939-40

	Adjusted operating expenses (1939-40	Fixed (F), variable (V)	Refer- ence	General overhead
	Dollars			
Packing-house expenses:				
Shook	30,000	V		
Wraps	12,000	V		
Labels	700	V		
Other packing materials	2,200	V		
Miscellaneous house supplies	2,070	V	(1)	
Waxing royalty	4,800	F		
Packing-house labor	63,920	V	(2)	
Supervision:				
Manager's salary	4,000	F	(3)	4,000
Foreman's salary	2,000	F	(4)	
Night watchman's salary	1,080	F		
Social security taxes	2,200	V	(5)	
Light and power	1,800	V	(6)	
Gas	800	V	(7)	
Water	300	V	(8)	
Building repairs	360	F	(9)	
Equipment repairs	600	F	(10)	
Depreciation on building	4,500	F	(11)	
Depreciation on equipment	4,000	F	(12)	
Depreciation on office equipment	450	F	(13)	
Insurance:				
Group insurance	275	F		
Public liability insurance	180	F		
Compensation insurance	500	V	(14)	
Fire insurance	1,357	F	(15)	
Property taxes	2,820	F	(16)	2,820
Interest expenses	2,000	F	(17)	2,000
Automobile and travel expenses	600	F	(18)	600
Bonds	100	F	(19)	100
Office salaries	2,600	F	(20)	2,600
Office supplies and expenses	400	F	(21)	400
Telephone and telegraph	200	F	(22)	200
Maintenance of grounds	200	F		
Directors' fees	400	F	(23)	400
Auditing expenses (contributions, legal, and auditing fees)	800	F	(24)	800
			(25)	
			(26)	
	150,212		(27)	
Number of standard field boxes handled				
Handling costs per standard field box				

* Numbers in parentheses refer to explanations of departmentalization shown in text, pp. 30 to 41.

Packing-house						Other operations	
Departments							
I Washing	II Storing	III Grading	IV Packing	V Packing-house overhead	Total packing-house expenses	Picking expenses (including labor camp)	Ware-house expenses
Dollars							
			30,000		30,000		
			12,000		12,000		
			700		700		
			2,200		2,200		
1,346	186	62		476	2,070		
			4,800		4,800		
19,815	3,835	7,671	32,599		63,920		
1,116	216	432	1,836		3,600	400	
620	120	240	1,020		2,000		
				1,080	1,080		
668	129	259	1,100	32	2,188	12	
180	1,440		180		1,800		
720			80		800		
180	120				300		
50	213		86	11	360		
222	138		240		600		
630	2,655		1,080	135	4,500		
1,480	920		1,600		4,000		
				428	428	22	
				275	275		
				180	180		
155	30	60	255		500		
272	556		475	54	1,357		
451	959		818	85	2,313	169	338
320	680		580	60	1,640	120	240
				540	540	60	
				95	95	5	
				2,470	2,470	130	
				380	380	20	
				190	190	10	
				200	200		
				380	380	20	
				760	760	40	
5,161F	6,457F	672F	12,535F	7,831F	32,656F	1,008	578
23,064V	5,740V	8,052V	79,114V		115,970V	Carried forward to table 6	
28,225	12,197	8,724	91,649	7,831	148,626		
450,000	405,000	405,000	263,250	450,000	450,000		
$.063	$.030	$.022	$.348	$.017	$.330		

expenses; and direct warehouse expenses which were segregated on the accounts of the association are assigned to the appropriate operation without further explanation. The bases for allocating other expenses are explained in the following notes whose numbers agree with those shown in the reference column of tables 5 and 6.

(1) Miscellaneous house supplies: This expense was segregated by classifying the beginning and final inventories of packing-house supplies, averaging the two together, and prorating the total of the supply expense account to the four departments and to packing-house overhead on the basis of these averages.

	Beginning inventory	Final inventory	Average inventory	Per cent	Miscellaneous supply expense
Washing	$500	$550	$525	65	$1,346
Storing	70	80	75	9	186
Grading	30	24	27	3	62
Packing-house overhead	200	176	188	23	476
	$800	$830	$815	100	$2,070

(2) Packing-house labor: Since pay rolls were not kept on a departmental basis by the association, it was necessary to classify sample pay rolls according to the type of work performed. In House X, eight pay-roll periods were selected which would reflect as nearly as possible different seasonal operations. Direct departmental labor for these eight pay rolls was totaled and used to allocate total direct labor expense for the season.

	Direct labor for eight pay rolls	Per cent	Total direct labor for season
Washing	$7,804	31	$19,815
Storing	1,541	6	3,835
Grading	3,042	12	7,671
Packing	13,013	51	32,599
	$25,400	100	$63,920

(3) Manager's salary: There can be no doubt that picking and field operations should bear part of this expense, but there is no way of determining objectively what the amount should be. Ten per cent of the manager's salary was arbitrarily charged to picking expense, and the remainder was prorated to the operating department on the basis of direct departmental labor.

Total salary	$4,000
Less 10 per cent charged to picking	400
Balance prorated on basis of direct departmental labor	$3,600

	Direct labor, in per cent	Manager's salary
Washing	31	$1,116
Storing	6	216
Grading	12	432
Packing	51	1,836
	100	$3,600

TABLE 6

Allocation of Picking and Warehouse Expenses

	Adjusted operating expenses, 1939-40	Other operations: Picking expenses (including labor camp)	Other operations: Warehouse expenses
	Dollars		
Expenses allocated from table 5		1,008	578
Picking expenses:			
Supervision	2,800	2,800	
Direct picking labor	83,000	83,000	
Social security taxes	2,500	2,500	
Group insurance	25	25	
Compensation insurance	1,500	1,500	
Public liability insurance	100	100	
Supplies, repairs, and miscellaneous	1,440	1,440	
Depreciation on equipment	800	800	
Fire insurance on equipment	8	8	
Automobile, truck, and tractor expenses:			
Depreciation	300	300	
Repairs	75	75	
Gasoline and oil	100	100	
Labor camp expenses (excess of direct expenses over rent received)	1,500	1,500	
Transportation for pickers	2,500	2,500	
	96,648		
Warehouse expenses:			
Labor and social security taxes	1,700		1,700
Truck expenses	200		200
Depreciation	210		210
Fire insurance	20		20
	2,130		
Total operating expenses	248,990	97,656	2,708
Number of standard field boxes handled		450,000	
Handling costs per standard field box		$.217	

(4) Foreman's salary: This expense was prorated on the basis of direct labor.

	Direct labor, in per cent	Foreman's salary
Washing	31	$ 620
Storing	6	120
Grading	12	240
Packing	51	1,020
	100	$2,000

(5) Social security taxes: After removing the estimated amount of the tax on the night watchman's salary and the manager's salary, the balance of the social security tax account was prorated on the basis of direct labor.

Total social security taxes		$2,200
Less: Packing-house overhead (3 per cent of $1,080 for night watchman's salary)	$32	
Picking expense (3 per cent of $400 for manager's salary)	12	44
Balance prorated on basis of direct departmental labor		$2,156

	Direct labor, in per cent	Social security taxes
Washing	31	$ 668
Storing	6	129
Grading	12	259
Packing	51	1,100
	100	$2,156

(6) Light and power: Light and power were combined and prorated together on the basis of estimates furnished by the manager. Due to the fact that grading belts are an integral part of the packing units, light and power used in the grading and packing room could not logically be divided between these two operations, and the total amount was arbitrarily charged to packing.

	Manager's estimates, in per cent	Light and power expense
Washing	10	$ 180
Storing	80	1,440
Packing	10	180
	100	$1,800

(7) Gas: Gas expense was allocated on the basis of estimates furnished by the manager. The amount charged to packing represents the cost of fuel required for waxing and sweating.

	Manager's estimates, in per cent	Gas expense
Washing	90	$720
Packing	10	80
	100	$800

(8) Water: This expense was prorated on the basis of estimates furnished by the manager.

	Manager's estimates in per cent	Water expense
Washing	60	$180
Storing	40	120
	100	$300

(9) Building repairs: This expense was prorated on the basis of floor space occupied by the various departments. Floor space used for grading could not be separated from that used for packing; therefore, space used for grading, packing, car loading, boxmaking, and storage of shook was combined and classified as packing space.

	Floor space, in square feet	Per cent	Building repair expenses
Washing	4,000	14	$ 50
Storing	16,500	59	213
Packing	6,600	24	86
Office (overhead)	800	3	11
	27,900	100	$360

(10) Equipment repairs: This expense was prorated on the basis of the cost of equipment used in each department. Equipment and machinery accounts were analyzed to determine the cost and location of each item of equipment. The cost of equipment used in each department was expressed as a percentage of the total cost of equipment in the packing-house. Grading and packing equipment could not be separated so all equipment used in the grading and packing room was assigned to the packing department.

	Cost of equipment	Per cent	Equipment repair expense
Washing	$30,400	37	$222
Storing	18,200	23	138
Packing	32,800	40	240
	$81,400	100	$600

(11) Depreciation on building: Building depreciation was prorated on the basis of floor space as in the case of building repairs.

	Floor space, in per cent	Depreciation on building
Washing	14	$ 630
Storing	59	2,655
Packing	24	1,080
Office (overhead)	3	135
	100	$4,500

(12) Depreciation on equipment: Depreciation on equipment was prorated on the basis of the cost of equipment used in various departments. As in the case of equipment repairs it was necessary to charge depreciation on the grading and packing unit to the packing department alone.

	Cost of equipment, in per cent	Depreciation on equipment
Washing	37	$1,480
Storing	23	920
Packing	40	1,600
	100	$4,000

(13) Depreciation on office equipment: Five per cent of this expense was arbitrarily charged against picking, and the remainder was classified as packing-house overhead.

	Per cent	Depreciation on office equipment
Packing-house overhead	95	$428
Picking expense	5	22
	100	$450

(14) Compensation insurance: Direct labor was used to prorate this expense.

	Direct labor, in per cent	Compensation insurance expense
Washing	31	$155
Storing	6	30
Grading	12	60
Packing	51	255.
	100	$500

(15) Fire insurance: This expense was prorated on the basis of net capital invested in building, equipment, and average supply inventories used in each department (see table 7, subtotal 1).

	Net invested capital (not including land)	Per cent	Fire insurance expense
Washing	$ 33,364	20	$ 272
Storing	68,950	41	556
Packing	59,606	35	475
Packing-house overhead	6,195	4	54
	$168,115	100	$1,357

(16) Property taxes: This expense was prorated on the basis of net invested capital. However, the percentages used for this allocation differ from those used for fire insurance since the cost of packing-house land, the net value of the picking equipment, the net value of the warehouse, and the grower supply inventory have been used in the calculation (see table 7, subtotal 2).

	Net invested capital	Per cent	Property tax expense
Washing	$ 34,148	16	$ 451
Storing	72,254	34	959
Packing	60,950	29	818
Packing-house overhead	6,363	3	85
Picking expense	13,500	6	169
Warehouse expense	26,100	12	338
	$213,315	100	$2,820

(17) Interest expense: Interest expense was allocated to all departments and all functions on the basis of net capital invested.

	Net invested capital, in per cent	Interest expense
Washing	16	$ 320
Storing	34	680
Packing	29	580
Packing-house overhead	3	60
Picking expense	6	120
Warehouse expense	12	240
	100	$2,000

(18) Automobile and travel expense: Ten per cent of this expense was charged to picking and the remainder to packing-house overhead. This allocation was made to conform to the 10 per cent of the manager's salary which was

TABLE 7

House X. Calculation of Net Invested Capital, 1939-40

	Book value of assets (cost less reserve for depreciation)	Basis of allocation	Packing-house department				Picking	Warehouse
			Washing	Storing	Packing	Overhead		
Packing-house building	$ 96,500	Floor space	$13,510	$56,935	$23,160	$2,895		
Railroad spur track	750	Direct			750			
Machinery and equipment	52,240	Cost of departmental equipment	19,329	12,015	20,896			
Office equipment	3,300	Direct				3,300		
Average supply inventory	15,325	Direct	525		14,800			
(1) Net capital used in each department (not including land)	$168,115		$33,364	$68,950	$59,606	$6,195		
Cost of land	5,600	Floor space	784	3,304	1,344	168		
Picking equipment	13,500	Direct					$13,500	
Warehouse building	5,000	Direct						$ 5,000
Growers' supply inventory	21,100	Direct						21,100
(2) Total net capital invested	$213,315		$34,148	$72,254	$60,950	$6,363	$13,500	$26,100

charged to picking operations.

	Per cent	Automobile and travel expense
Packing-house overhead	90	$540
Picking expense	10	60
	100	$600

(19), (20), (21), (22), (23), and (24) Office expenses and other overhead items were arbitrarily allocated on the basis of 5 per cent to picking and 95 per cent to packing overhead.

(25), (26), (27), (28), and (29) After all expenses were allocated to an operating department or to a major function, the work sheet was totaled (references (25), (26), and (27)) and the number of standard field boxes handled in each department was entered (reference (28)). Total departmental expense divided by the number of standard field boxes handled gives the handling cost per standard field box (reference (29)). No attempt was made to allocate packing-house overhead to one of the four operating departments because overhead does not directly affect departmental efficiency.

Reconciliation of Adjusted Operating Expenses With Those Reported by the Packing-House.-- Before goingany further with the analysis of the adjusted departmental costs, it will be well to summarize the adjustments which have been made to operating expenses. This is done in the following reconciliation:

Operating expenses per packing-house statement		$127,526
Add: Handling charge on by-products credited to packing-house labor expense account	$14,747	
Waxing royalty charged by house directly against returns	4,800	
Additional depreciation on buildings and equipment	2,000	
Insurance expense not recorded	1,317	22,864
		$150,390
Deduct: Total expenses charged to picking and warehouse		1,764
Adjusted packing-house expenses		$148,626

Segregation of Departmental and Overhead Costs by Method of Disposal.-- Table 8 illustrates the procedure for allocating departmental and overhead expenses to by-products, loose, and packed fruit. Total fixed and variable departmental expenses were taken from table 5 , references (25) and (26). It was assumed that costs follow the flow of fruit on a volume basis; therefore the percentages used in directing the flow of costs through the packing-house are those shown in figure 4. Overhead was allocated to by-products, loose, and packed fruit on the basis of total accumulated expenses brought forward from the various departments.

TABLE 8

House X. Allocation of Fixed and Variable Costs to By-Products, Loose, and Packed Fruit

1939-40

		Packing-house department						Method of disposal				
		Receiving and washing	Storing	Grading	Packing	Overhead	Total	Shrinkage	By-products fruit	Loose fruit	Packed fruit	Total
		Dollars										
Total departmental cost		5,161F 23,064V	6,457F 5,740V	672F 8,052V	12,535F 79,114V	7,831F	32,656F 115,970V					32,656F 115,970V
Receiving and washing to:												
By-products	10%								516F 2,306V			
Storage	90%		4,645F 20,758V									
			11,102F 26,498V									
Total storing to:												
Grading	100%			11,102F 26,498V								
				11,774F 34,550V								
Total grading to:												
Shrinkage	10%							1,177F 3,455V				
By-products fruit	20%								2,355F 6,910V			
Loose fruit	5%									589F 1,728V		
Packing dept.	65%				7,653F 22,457V							
					20,188F 101,571V							
Total packing to:												
Packed fruit	100%										20,188F 101,571V	
								1,177F 3,455V 5,732				

Loss on shrinkage to:											
By-products fruit 25%								294F 864V			
Loose fruit 5%									59F 173V		
Packed fruit 70%										824F 2,418V	
					7,831F			3,165F 10,080V	648F 1,901V	21,012F 103,989V	
Total direct fixed and variable costs								13,245	2,549	125,001	
Overhead to:											
By-products fruit 9%								705F			
Loose fruit 2%									157F		
Packed fruit 89%										6,969F	
								3,870F 10,080V	805F 1,901V	27,981F 103,989V	32,656F 115,970V
Total costs								13,950	2,706	131,970	148,626
Number of standard field boxes by method of disposal							40,500	126,000	20,250	263,250	409,500
Total handling costs per standard field box actually sold or lost							$.142	$.111	$.134	$.501	$.363

Analysis of Grower Returns.-- The component elements of grower returns reported by House X and the corresponding elements of the adjusted grower returns are shown in table 9. The adjusted returns may be reconciled with the house returns as follows:

Net returns to growers reported by packing-house		$481,518
Add: Estimated returns on by-products fruit	$55,301	
Expenses charged to picking and warehouse	1,764	57,065
		$538,583
Deduct: "Pencil pack" credits	$12,350	
Handling charge on by-products fruit	14,747	
Insurance retain	1,317	
Additional depreciation expense	2,000	30,414
Adjusted net grower returns at receiving door		$508,169

SUMMARY OF ANALYSIS FOR EIGHT LEMON PACKING-HOUSES

Volume of Fruit Handled.-- Table 10 gives the results of the analysis of the physical flow of fruit through each of the eight houses. The numbers of standard field boxes washed, stored, graded, and disposed of as loose, packed, and by-products fruit have been expressed as percentages of the total number of standard field boxes received by each house. The actual amount of fruit handled in various stages is not given as this would disclose the identity of the houses.

Adjustments to Costs and Returns.-- Tables 11 and 12 show why it is unwise to rely upon published statements for information concerning operating costs and grower returns. Net adjustments produced changes in operating costs covering an absolute range of 20 per cent. For the eight houses studied, the most important adjustment to costs was the correction for the handling charge on by-products fruit which had been credited by three of the associations to the labor expense account.

Net adjustments to returns produced changes covering an absolute range of 25 per cent. The most important of these adjustments were those made necessary by different policies with respect to returns on by-products fruit.

Analysis of Costs.-- The relative importance of the various elements of packing-house costs is shown in table 13. Direct labor, materials, taxes, depreciation, etc., have been expressed as percentages of total operating costs. In table 14 the same categories of costs have been subclassified by departments and the amounts again expressed as percentages of total operating costs.

Table 15 gives departmental and overhead costs per standard field box handled at each stage. The unit costs shown in this table are summarized in table 16. These unit costs are the most important statistical measures of operating efficiency available. It does not follow, however, that House H is the most efficient and that House F is the least efficient. Much additional data must be obtained and analyzed before any conclusions concerning relative efficiency can be drawn.

Table 17 shows unit handling costs for packed, loose, and by-products fruit.

TABLE 9

House X. Net Returns to Growers at Receiving Door
1939-40

	Grower returns as reported by packing-house		Adjusted grower returns	
F.o.b. returns for packed fruit	$504,450		$504,450	
Less packing retain	-192,568		-192,568	
Less waxing royalty	- 4,800			
Packed fruit credits		$307,082		$311,882
F.o.b. returns for loose fruit	$ 21,200			
Less retain	- 4,558			
Loose fruit credits		16,642		16,642
"Pencil pack" credits		12,350		--
Association revolving fund credits		28,190		28,190
By-products company stock credits		3,840		3,840
Supply company stock credits		7,680		7,680
Packing refund		105,734*		84,634*
Estimated returns on by-products fruit				55,301†
Net returns to growers at receiving door		$481,518		$508,169‡
Net returns per standard field box (450,000 s.f.b.)		$ 1.07		$ 1.13

* Calculation of packing-house refund:

	Refund per packing-house	Adjusted refund
Total retains and revenue	$233,260	$249,324
Less packing-house expenses	-127,526	-148,626
Less handling charge on by-products fruit		- 14,747
Less insurance retain		- 1,317
Packing-house refund	$105,734	$ 84,634

† By-products returns estimated at $15 per ton.

‡ Picking and hauling costs have not been deducted.

TABLE 10

Standard Field Boxes* Handled by Each Department and Field Boxes Disposed of Expressed as Per cent of Total Standard Field Boxes Received by Eight Lemon Packing-Houses, 1939-1940

	A	B	C	D	E	F	G†	H	Average (omitting G)
	per cent	per cent	per cent	per cent	per cent	per cent		per cent	per cent
Field boxes washed	100.0	100.0	100.0	100.0	100.0	100.0		100.0	100.0
Field boxes stored	89.0	87.0	87.0	91.0	93.2	87.0		82.0	88.0
Field boxes carried over				6.4					--
Field boxes graded	89.0	87.0	87.0	84.6	93.2	87.0		82.0	87.0
Field boxes sold packed	56.0	56.3	63.2	51.6	62.2	60.8		53.7	57.7
Field boxes sold loose	4.9	5.6	5.6	3.3	6.2	5.4		3.7	5.0
Field boxes sent to by-products:									
From washer	11.0	13.0	13.0	9.0	6.8	13.0		18.0	12.0
From grading belt	18.7	18.2	10.1	22.0	20.3	15.0		16.0	17.2
Total field boxes sent to by-products	29.7	31.2	23.1	31.0	27.1	28.0		34.0	29.2
Field boxes lost by shrinkage	9.4	7.0	8.1	7.7	4.5	5.8		8.6	7.3
Total standard field boxes handled	100.0	100.0	100.0	100.0	100.0	100.0		100.0	100.0

* Standard field box = 2,926 cubic inches.

† House G omitted because data are not comparable.

TABLE 11

Adjustments to Costs for Eight Lemon Packing-Houses, 1939-40

House	Added	Deducted	Net change	Per cent change
A	$ 8,200	$2,000	$+ 6,200	+ 5
B	2,300	9,800	- 7,500	- 4
C	1,400	2,200	- 800	- 1
D	30,800	2,100	+28,700	+12
E	28,000	2,300	+25,700	+16
F	5,800	4,900	+ 900	+ 1
G	8,300	7,700	+ 600	+ 1
H	$12,500	$6,100	$+ 6,400	+ 6

TABLE 12

Adjustments to Returns for Eight Lemon Packing-Houses, 1939-40

House	Added	Deducted	Net change	Per cent change
A	$46,100	$68,900	$-22,800	- 8
B	71,400	1,800	+69,600	+17
C	30,600	29,000	+ 1,600	+ ½
D	99,200	107,100	- 7,900	- 1
E	60,200	18,400	+41,900	+10
F	23,200	5,300	+17,900	+10
G	11,100	600	+10,500	+ 5
H	$56,600	$14,800	$+41,800	+15

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3 +	[illegible]	[illegible]	[illegible]	[illegible]
4 -	[illegible]	[illegible]	[illegible]	
1 -	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
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1 +	[illegible]	[illegible]	[illegible]	
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TABLE 13

Elements of Adjusted Packing-House Costs for Eight Lemon Packing-Houses Expressed as Per Cent of Total Costs, 1939-40

	A	B	C	D	E	F	G	H	Average
	Per cent								
Direct labor (pay roll taxes and compensation insurance)	40.3	46.3	52.6	41.6	42.0	37.3	41.9	49.0	43.9
Supervision	3.4	2.8	2.7	3.0	2.5	6.8	5.2	5.1	3.9
Materials	26.4	32.0	25.5	29.5	27.2	24.1	36.8	26.8	28.5
Waxing and washing royalty	1.1	--	1.8	2.9	5.1	--	6.1	--	--
Ammonia gas	--	--	0.1	--	4.7	--	--	--	--
Ice, hauling, and miscellaneous	2.9	0.1	--	--	2.5	--	--	--	--
Water, light, power, fuel	5.3	1.3	2.0	2.5	2.5	4.7	1.0	2.3	2.7
Taxes and fire insurance	4.1	2.7	1.7	3.3	3.4	5.5	1.6	3.5	3.2
Building and equipment repairs	0.9	0.9	3.2	1.3	0.7	0.9	0.2	1.1	1.2
Depreciation (buildings and equipment)	10.5	6.1	4.8	8.0	5.9	10.4	3.5	4.4	6.7
Overhead:									
Office expenses: salaries, pay roll taxes, fire insurance, telephone, depreciation, taxes	2.4	2.3	2.9	3.1	2.2	3.9	2.0	4.0	2.9
Interest	0.4	3.6	1.4	1.5	0.5	4.9	0.6	1.3	2.2
All other expenses: auto expense, contributions, maintenance of grounds, public liability insurance, group insurance, miscellaneous supplies, directors' fees	2.3	1.9	1.3	3.3	0.8	1.5	1.1	2.5	1.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.0 *

* Average column does not total 100 per cent due to the omission of average waxing and washing royalty expense, ammonia gas expense, and miscellaneous expense.

TABLE 14

Departmental and Overhead Costs Expressed as Per Cent of Total Costs for Eight Lemon Packing-Houses, 1939-1940

	A	B	C
	Per cent		
Receiving and washing:			
Labor (pay roll taxes and compensation insurance)	11.13	14.17	14.22
Materials	1.14	1.28	0.62
Water, light, power, fuel	1.24	1.02	0.71
Taxes and fire insurance	1.43	0.40	0.35
Building and equipment repairs	0.16	0.24	1.02
Depreciation on building and equipment	2.02	1.24	1.25
Supervision	0.99	0.86	0.73
Washing royalty	0.47	--	--
	18.58	19.21	18.90
Storage:			
Labor (pay roll taxes and compensation insurance)	2.47	3.42	4.07
Materials	--	--	--
Water, light, power, fuel	3.72	0.10	1.16
Taxes and fire insurance	1.62	1.40	0.98
Building and equipment repairs	0.56	0.18	1.34
Depreciation	6.14	2.33	2.40
Supervision	0.20	0.17	0.22
Ammonia gas	--	--	0.10
	14.71	7.60	10.27
Grading:			
Labor (pay roll taxes and compensation insurance)	4.93	5.44	12.05
Supervision	0.41	0.33	0.62
Miscellaneous	1.08	0.12	--
	6.42	5.89	12.67
Packing:			
Labor (pay roll taxes and compensation insurance)	21.78	23.30	22.28
Materials	25.24	30.77	24.92
Water, light, power, fuel	0.30	0.20	0.14
Taxes and fire insurance	1.00	0.95	0.35
Building and equipment repairs	0.19	0.45	0.86
Depreciation	2.34	2.50	1.15
Supervision	1.80	1.41	1.13
Waxing royalty	0.65	--	1.82
Ice, hauling, and miscellaneous	1.86	--	--
	55.16	59.58	52.65
Overhead:			
Office expenses: salaries, pay roll taxes, fire insurance, telephone, depreciation, taxes	2.42	2.28	2.89
Interest	0.38	3.57	1.34
All other expenses: auto expense, contributions, maintenance of grounds, public liability insurance, group insurance, miscellaneous supplies, directors' fees	2.33	1.87	1.28
	5.13	7.72	5.51
Total packing-house expenses	100.00	100.00	100.00

* Subtotals of individual expenses do not exactly agree with average total departmental expenses due to the fact that not all houses incur certain types of costs.

D	E	F	G	H	Average*
Per cent					
12.02	15.00	12.41	12.86	13.50	13.16
1.21	0.18	0.52	0.06	1.16	0.77
0.89	0.89	1.53	0.77	0.97	1.00
0.41	0.34	0.92	0.21	0.51	0.57
0.18	0.09	0.28	0.02	0.30	0.29
1.22	0.73	1.84	0.39	1.36	1.26
1.16	0.89	2.26	1.62	1.42	1.24
--	1.71	--	2.02	--	1.40
17.09	19.83	19.76	17.95	19.22	18.82
3.96	2.78	2.79	2.57	3.90	3.24
--	--	0.35	0.01	0.13	0.16
1.50	1.38	2.53	--	1.02	1.63
1.95	2.30	2.84	0.73	1.59	1.68
0.74	0.51	0.17	0.01	0.58	0.51
5.13	4.35	5.39	1.32	2.00	3.63
0.12	0.12	0.55	0.31	0.30	0.24
--	4.76	--	--	--	2.43
13.40	16.20	14.62	4.95	9.52	11.40
10.65	5.15	5.31	5.04	9.46	7.25
0.47	0.32	0.96	0.62	1.01	0.59
--	0.02	--	--	--	0.41
11.12	5.49	6.27	5.66	10.47	8.00
15.01	19.03	16.79	21.47	22.19	20.23
28.29	27.04	23.22	36.74	25.51	27.72
0.12	0.26	0.65	0.26	0.27	0.28
0.94	0.74	1.77	0.60	1.45	0.98
0.35	0.12	0.45	0.20	0.20	0.35
1.63	0.79	3.11	1.75	1.02	1.79
1.27	1.14	3.08	2.61	2.33	1.85
2.86	3.36	--	4.05	--	2.55
--	2.49	--	--	--	2.18
50.47	54.97	49.07	67.68	52.97	55.32
3.13	2.20	3.90	2.03	4.01	2.86
1.52	0.48	4.85	0.61	1.28	1.75
3.27	0.83	1.53	1.12	2.53	1.84
7.92	3.51	10.28	3.76	7.82	6.46
100.00	100.00	100.00	100.00	100.00	100.00

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TABLE 15

Unit Departmental and Overhead Costs on Basis of Standard Field Boxes Handled in Eight Lemon Packing-Houses, 1939-1940

	A	B
	Cents	
Receiving and washing:		
Labor (pay roll taxes and compensation insurance)	0.039	0.042
Materials	0.004	0.004
Water, light, power, fuel	0.004	0.003
Taxes and fire insurance	0.005	0.001
Building and equipment repairs	0.001	0.001
Depreciation	0.007	0.004
Supervision	0.003	0.003
Washing royalty	0.002	
	0.065	0.057
Storage:		
Labor (pay roll taxes and compensation insurance)	0.010	0.012
Materials	--	--
Water, light, power, fuel	0.015	*
Taxes and fire insurance	0.006	0.005
Building and equipment repairs	0.002	0.001
Depreciation	0.024	0.008
Supervision	0.001	0.001
Ammonia gas	--	--
	0.058	0.026
Grading:		
Labor (pay roll taxes and compensation insurance)	0.019	0.018
Supervision	0.002	0.001
Miscellaneous	0.004	*
	0.025	0.020
Packing:		
Labor (pay roll taxes and compensation insurance)	0.136	0.122
Materials	0.157	0.161
Water, light, power, fuel	0.002	0.001
Taxes and fire insurance	0.006	0.005
Building and equipment repairs	0.001	0.002
Depreciation	0.015	0.013
Supervision	0.011	0.007
Waxing royalty	0.004	--
Ice, hauling, and miscellaneous	0.012	--
	0.344	0.312
Overhead:		
Office expenses: salaries, pay roll taxes, fire insurance, depreciation, taxes, telephone	0.008	0.007
Interest	0.001	0.011
All other expenses: auto expenses, contributions, maintenance of grounds, public liability insurance, group insurance, miscellaneous supplies, directors' fees	0.008	0.005
	0.018	0.023
Unit costs per standard field box received	0.349	0.295

* Less than 0.0005.

C	D	E	F	G	H	Average
			Cents			
0.047	0.036	0.054	0.046	0.042	0.038	0.043
0.002	0.004	0.001	0.002	*	0.003	0.003
0.002	0.003	0.003	0.006	0.003	0.003	0.003
0.001	0.001	0.001	0.003	0.001	0.001	0.002
0.003	0.001	*	0.001	*	0.001	0.001
0.004	0.004	0.003	0.007	0.001	0.004	0.004
0.002	0.004	0.003	0.008	0.005	0.004	0.004
		0.006		0.007		0.005
0.062	0.052	0.072	0.074	0.059	0.054	0.062
0.015	0.013	0.011	0.012	0.009	0.013	0.012
--	--	--	0.001	*	*	--
0.004	0.005	0.005	0.011	--	0.004	0.006
0.004	0.006	0.009	0.012	0.003	0.005	0.006
0.005	0.002	0.002	0.001	*	0.002	0.002
0.009	0.017	0.017	0.023	0.005	0.007	0.014
0.001	*	*	0.002	0.001	0.001	0.001
*	--	0.018	--	--		--
0.039	0.045	0.063	0.063	0.017	0.033	0.043
0.046	0.038	0.020	0.023	0.017	0.033	0.027
0.002	0.002	0.001	0.004	0.002	0.003	0.002
--	--	*	--	--	--	--
0.048	0.040	0.021	0.027	0.020	0.036	0.030
0.116	0.088	0.110	0.103	0.089	0.117	0.110
0.130	0.166	0.157	0.142	0.152	0.134	0.150
0.001	0.001	0.002	0.004	0.001	0.001	0.002
0.002	0.006	0.004	0.011	0.002	0.008	0.006
0.004	0.002	0.001	0.003	0.001	0.001	0.002
0.006	0.010	0.005	0.019	0.007	0.005	0.010
0.006	0.007	0.007	0.019	0.011	0.012	0.010
0.009	0.017	0.019	--	0.017	--	0.013
	--	0.014	--	--	--	0.013
0.274	0.296	0.319	0.301	0.280	0.279	0.301
0.009	0.009	0.008	0.015	0.007	0.011	0.009
0.004	0.005	0.002	0.018	0.002	0.004	0.006
0.004	0.010	0.003	0.006	0.004	0.007	0.006
0.018	0.024	0.013	0.038	0.012	0.022	0.021
0.329	0.303	0.361	0.373	0.326	0.282	0.327

TABLE 16

Unit Departmental Costs Based on Standard* Field Boxes Handled in Eight Lemon Packing-Houses, 1939-40

House	Receiving and washing	Storing	Grading	Packing	Overhead	Total
A	$ .065	$ .058	$ .025	$ .344	$ .018	$ .349
B	.057	.026	.020	.312	.023	.295
C	.062	.039	.048	.274	.018	.329
D	.052	.045	.040	.296	.024	.303
E	.072	.063	.021	.319	.013	.361
F	.074	.063	.027	.301	.038	.373
G	.059	.017	.020	.280	.012	.326
H	.054	.033	.036	.279	.022	.282
Average	$ .062	$ .043	$ .030	$ .301	$ .021	$ .327

* Standard box = 2,926 cubic inches.

TABLE 17

Unit Handling Costs for Packed, Loose, and By-Products Fruit in Eight Lemon Packing-Houses, 1939-40

House	Packed fruit - cost per		Loose fruit - cost per		By-products per standard field box
	Packed box	Standard field box	Loose box	Standard field box	
A	$ .86	$ .54	$ .24	$ .19	$ .13
B	.74	.46	.16	.11	.10
C	.80	.46	.22	.16	.12
D	.76	.48	.30	.25	.14
E	.77	.50	.20	.15	.15
F	.93	.53	.27	.19	.14
G	.71	.40	--	--	.08
H	.76	.45	.18	.16	.10
Average	$ .79	$ .48	$ .22	$ .17	$ .12

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Analysis of Returns.-- Table 18 shows net returns to growers per standard field box for packed, loose, and by-products fruit.

CONCLUSIONS

At the time this study was undertaken, it was not expected that final conclusions concerning the optimum size of a packing-house could be formulated on the basis of data obtained from only eight houses. It was necessary to limit the study to a small number of houses in the beginning because the primary objective was to make a preliminary survey of the problems involved in measuring the operating efficiency of a lemon packing-house and to lay the foundation for a more extensive study of internal and external efficiency factors. The work must now be extended to include a much larger number of houses before the importance of various factors which influence operating costs can be measured and analyzed with precision. However, there are certain tentative conclusions which may be drawn from the analysis already completed and these conclusions will be useful in making plans for the future conduct of the study.

Effect of Volume Upon Unit Operating Costs.-- Figure 5 shows the relationship between total handling cost per standard field box and the total volume of fruit handled in eight packing-houses. The unit costs used in making this diagram should be the same as those shown in table 16, column 7, but these data were slightly changed before they were plotted against volume so as to prevent disclosing the identity of the houses. The actual volume of fruit handled by the houses is not shown in this report for the same reason.

If the management of all houses were equally efficient, if the prices of all factors of production were the same for all houses, and if operating conditions were the same (except for the volume of fruit handled), the points in figure 5 would fall along a "U"-shaped curve similar to the dotted line in this figure. To the extent that the efficiency of management, the prices of productive factors, and operating conditions are not the same for all houses, the pattern will be obscured. There is some indication that volume has an effect upon unit operating cost, but apparently this is not the only important variable present. Until similar data are available for twenty or thirty houses and the effect of each variable has been measured and eliminated, we cannot say exactly what volume of fruit will allow the most efficient operation. However, such evidence as is available indicates that optimum efficiency (evidenced by lowest unit operating cost) cannot be expected in a house handling less than 300,000 standard field boxes a year. A volume as large as this is required before fixed and overhead costs per unit can be sufficiently reduced. There is also some indication that a house which handles more than 650,000 standard field boxes a year may be operating beyond the point of optimum efficiency. Table 19 indicates that 24 per cent of total operating costs in the eight packing-houses are fixed and 76 per cent are variable. Fixed costs per unit handled may be constantly reduced as the volume of fruit is increased; but such costs constitute only one fourth of total operating costs, and beyond the least-cost point the possible reduction in such costs becomes unimportant relative to unit variable costs which must inevitably increase as operations are pushed beyond the optimum scale (see fig. 6).

The preceding discussion has been presented in terms of average total unit costs, average variable costs, and average fixed costs; but averages conceal variations in specific cost elements. For this reason it is necessary to examine the relationship between the volume of fruit handled and the unit departmental

TABLE 18

Gross and Net Returns to Growers per Standard Field Box Sold for Eight Lemon Packing-Houses, 1939-40

	A	B	C	D	E	F	G*	H
Gross receipts on packed	$1.62	$1.77	$1.77	$1.75	$1.83	$1.82		$1.54
Unit cost	.54	.46	.46	.48	.50	.53		.45
Net returns on packed	1.08	1.31	1.31	1.27	1.33	1.29		1.09
Gross receipts on loose	.74	.82	.78	1.19	.85	.97		.89
Unit cost	.19	.11	.16	.25	.15	.19		.16
Net returns on loose	.55	.71	.62	.94	.70	.78		.73
Estimated returns for culls	.37	.35	.35	.38	.37	.33		.37
Unit cost	.13	.10	.12	.14	.15	.14		.10
Net estimated returns for culls	.24	.25	.23	.24	.22	.19		.27
Total net returns (excluding shrinkage)	.78	.92	1.00	.88	.98	.94		.77
Total net returns per field box delivered	.71	.86	.92	.76	.93	.88		.70

* House G omitted because data are not comparable.

TABLE 19

Fixed and Variable Costs in Eight Lemon Packing-Houses, 1939-1940

Packing-house	Percentage of total costs	
	Fixed	Variable
	per cent	per cent
A	26.2	73.8
B	20.3	79.7
C	19.8	80.2
D	26.4	73.6
E	25.8	74.2
F	33.9	66.1
G	20.2	79.8
H	21.9	78.1
Average	24.3	75.7

Fig. 5.-- Relationship of Cost per Standard Field Box

to Number of Standard Field Boxes

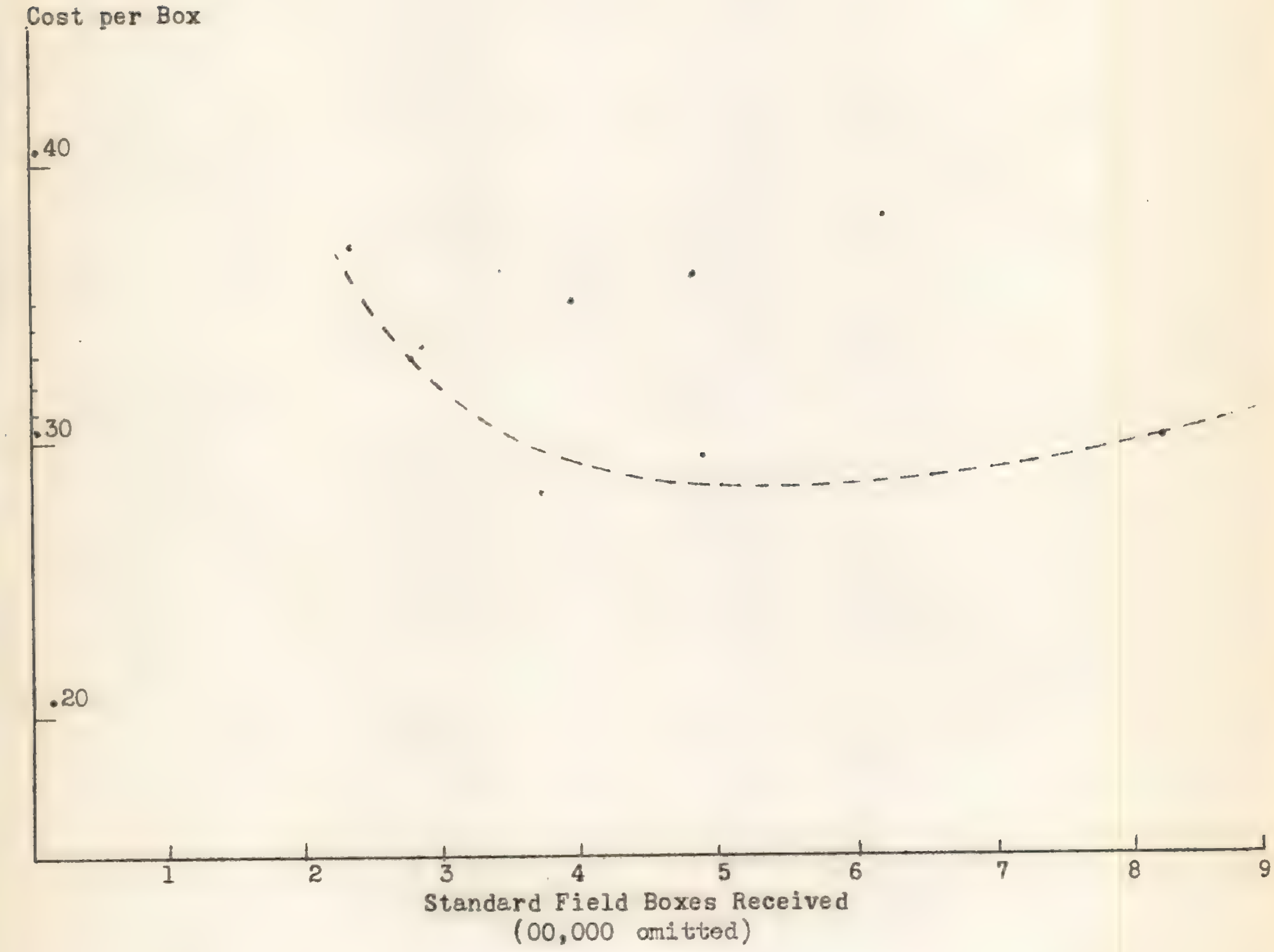
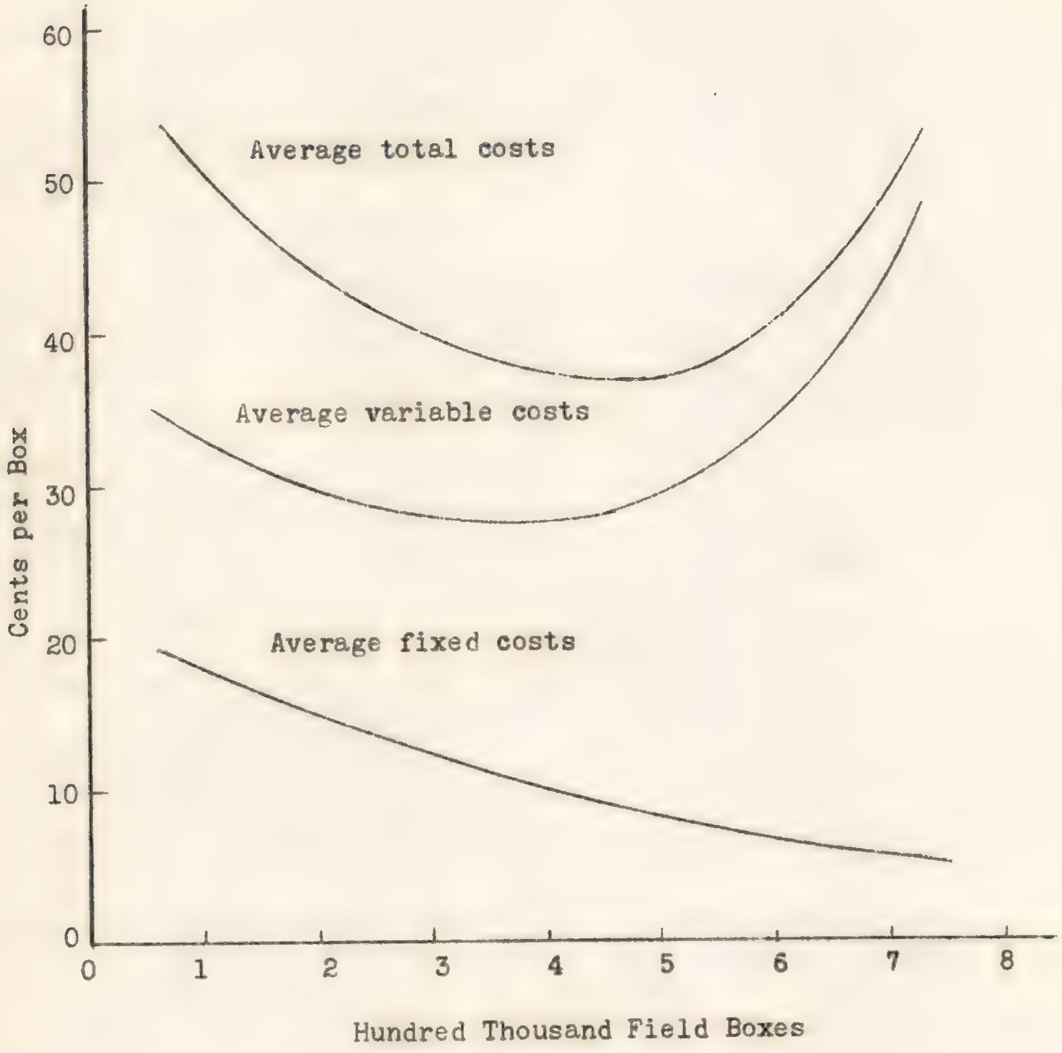


Fig. 6.
Average Fixed, Variable, and Total Costs



costs shown in table 15. These relationships are presented graphically in figures 7, 8, and 9. As in the case of total unit costs, the data have been altered to prevent disclosing the identity of the houses. Examination of the figures reveals no apparent association between volume and unit costs. This is partly due to the paucity of the data and the difficulty of securing comparable cost classifications from records as they are now kept in the various houses. A more important reason is that the effect of volume is obscured by the absence of homogeneous operating conditions and by the influence of different managerial policies. Adjustments must eventually be made which will eliminate the effect of different operating conditions and different managerial policies upon unit costs if the effect of volume alone is to be determined.

Effect of Location Upon Operating Costs.-- Although location is an environmental factor over which management has no extensive control, it has an extremely important effect upon operating costs. Variations in costs arising from differences in location must be eliminated if we are to study the effect of volume, managerial policies, and other factors over which control can be exercised. It is impossible, however, to measure the effect of location per se; the term "location" embraces diverse elements, each of which must be considered separately.

(1) Prevailing wage level: Table 13 shows that direct labor cost varies from 37 per cent to 52 per cent of total packing-house costs in the eight houses, the average being 44 per cent. This variation may be due to two factors: (a) differences in the efficiency of labor, and (b) differences in wage rates prevailing in various areas. Preliminary investigations show that considerable variations in wage rates do exist. Additional data pertaining to the number of hours spent on each operation must be collected which will make it possible to eliminate the effect of this variable.

(2) Air and refrigeration costs: Table 15 indicates that unit storage costs range from $0.017 to $0.063. To a large extent this is due to the fact that houses located near the coast do not have to install and maintain expensive insulation material, air conditioning equipment, and refrigeration equipment. If expense accounts were correctly kept, it would be a simple matter to eliminate all expenses incurred in connection with such equipment (labor, depreciation, power, repairs, interest, and taxes) and thereby make all houses more nearly comparable. Preliminary calculations indicate that the degree of scatter (variation from the dotted line) in figure 5 is reduced by the elimination of such costs.

(3) Quality of fruit: It is generally recognized that there is an inverse relationship between the quality of fruit handled and unit operating costs. In other words, houses operating in those areas where the best grades of fruit are grown will tend to have lower unit costs. The advantage enjoyed by houses handling the best grades of fruit is not entirely the result of location. There is evidence that some houses have been able to select their members so that the average grade of fruit handled is definitely superior to that handled by other associations operating in the same area.

In addition to the average quality of fruit handled, uniformity of color, grade, and size will tend to reduce handling costs. Data already collected throw little light upon these relationships. It will be necessary to gather information pertaining to costs, color, grade, and size from a large number of associations before the effect of uniformity and grade upon unit costs can be satisfactorily determined.

Fig. 7.-- Relationship of Unit Packing Costs to Volume of Fruit Packed

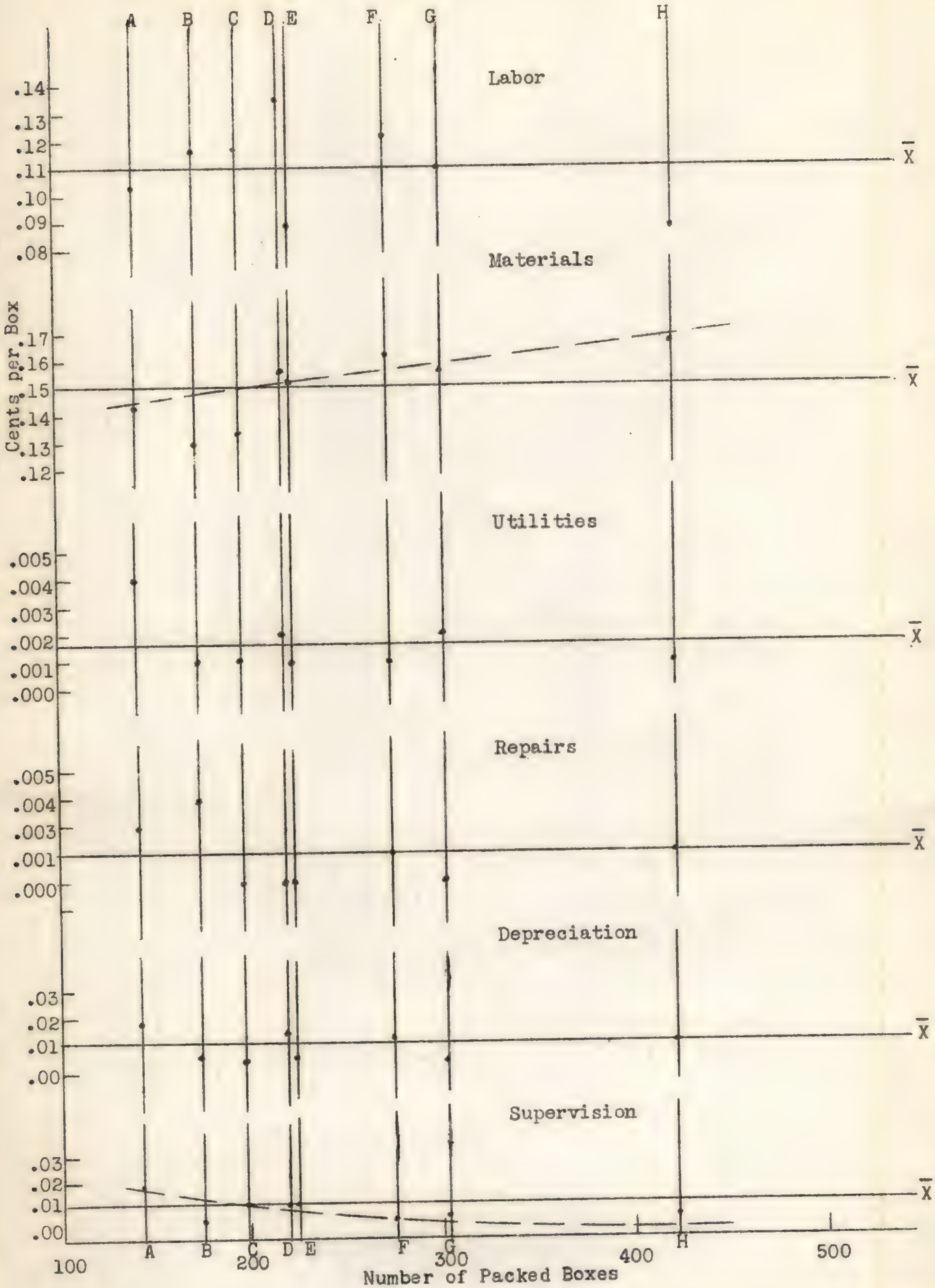


Fig. 8.-- Relationship of Unit Receiving and Washing Costs to Volume of Fruit Received

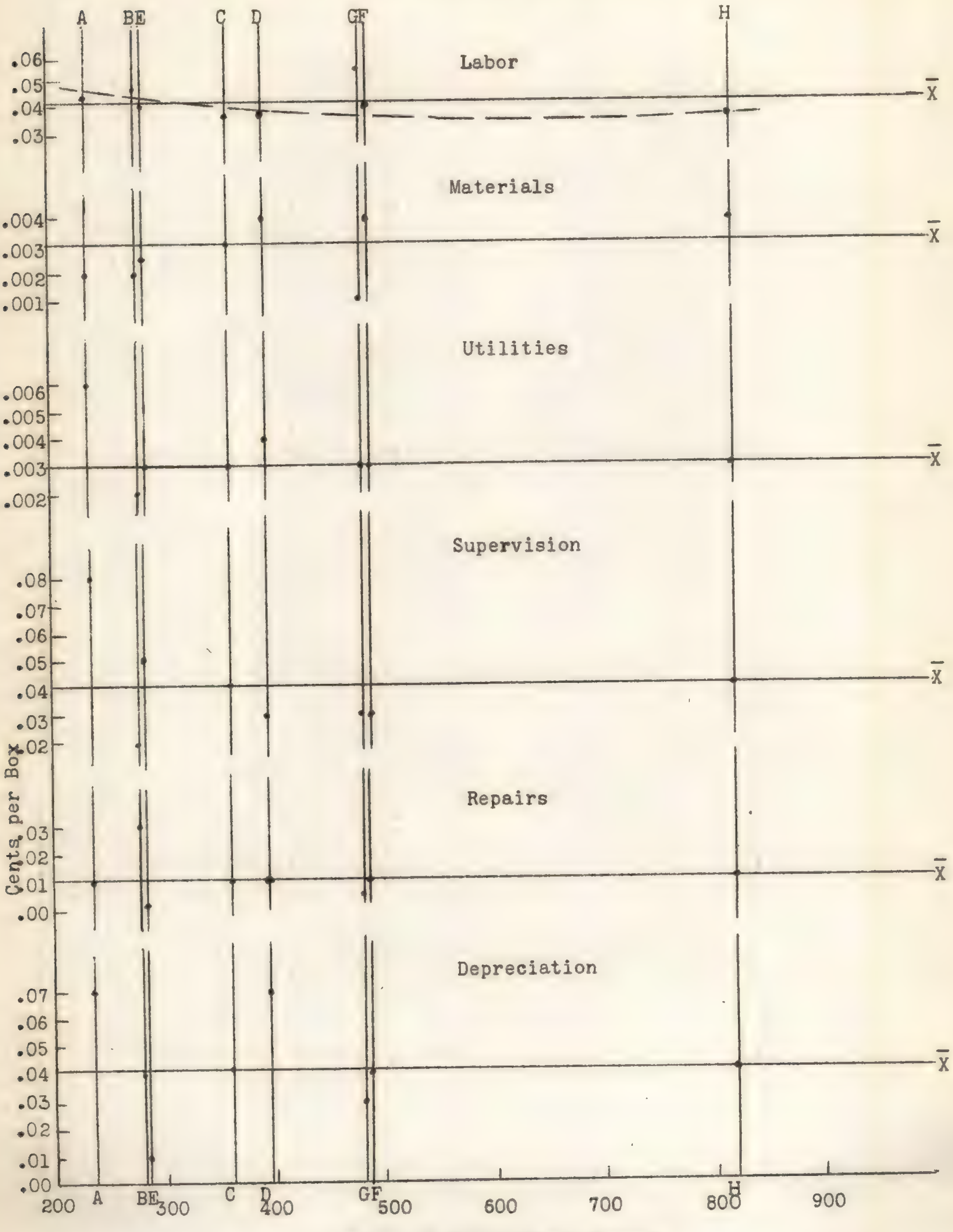
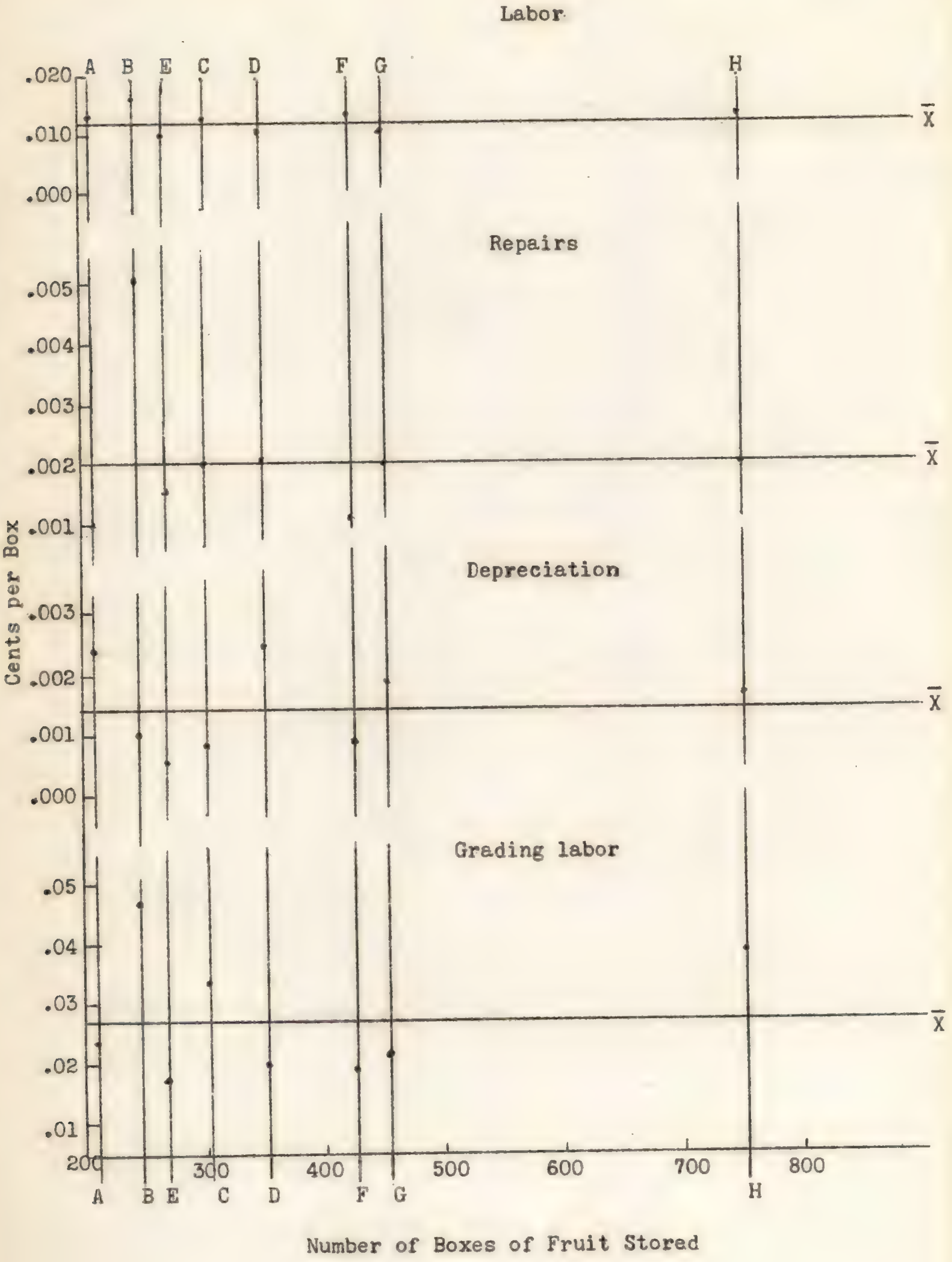


Fig. 9.-- Relationship of Unit Storage Costs to Volume of Fruit Stored



(4) Maturity season:[11] Storage costs are directly influenced by differences in maturity dates of different areas. Figure 10 illustrates the seasonal variation of picks for four packing associations in different geographical areas. Figure 11 shows the lag which exists between picks and shipments for House W. If fruit must be picked in early spring and held in storage for several months in anticipation of a better market in the summer, handling costs and loss from shrinkage would be greater than they would be if the maturity date more nearly coincided with the period of greatest consumer demand. Data for a large number of associations must be obtained before the effect of this variable can be analyzed. Seasonal indexes of the volume of fruit picked must be constructed and houses with the same maturity seasons segregated. The effect of the maturity date can then be studied by comparing the variation of operating costs within each group of houses having the same maturity season with the variation of operating costs between groups of houses having different maturity seasons.

Effect of Managerial Policies Upon Operating Costs.-- When we speak of "managerial policy" we refer to any plan of operation which may have been formulated by the board of directors, the manager, or the members themselves and transmuted into definite policies through directors acting in their behalf. Operating efficiency (or lack of efficiency) is the complex resultant of all such policies followed by an association.

(1) Pooling system: For the 1939-40 season, one association was found to use monthly shipping pools, one had two shipping pools, and the other six used pick-around pools varying in number from three to nine. One association pooled returns on the basis of grade only; all others pooled returns by grade and size. Conclusive evidence as to the effect of the pooling plan upon operating efficiency is not available thus far, but there can be little doubt that accounting costs will be higher if a house uses eight or nine picking pools than they would be if shipping pools or two picking pools were used.[12] Additional study will be required to determine the effect of various pooling plans upon operating and accounting costs.

(2) Sizing at the washer: Six associations used mechanical sizers at the washer to remove lemonettes which were generally sent direct to the by-products plant. Four of these six associations made some attempt to segregate the remaining fruit by sizes so that the fruit might be arranged according to size (as well as by color) in the storage rooms. This work, which must be done by inspection, increases the cost of sorting at the washer, but the practice reduces handling costs when the fruit is brought out of storage for grading and packing. The demand for small sizes is especially great in late spring, and unless size segregations have been made in the storage room, the house must either pack all sizes regardless of demand or put the unwanted sizes back in storage to be brought out and graded again when the market is more favorable.

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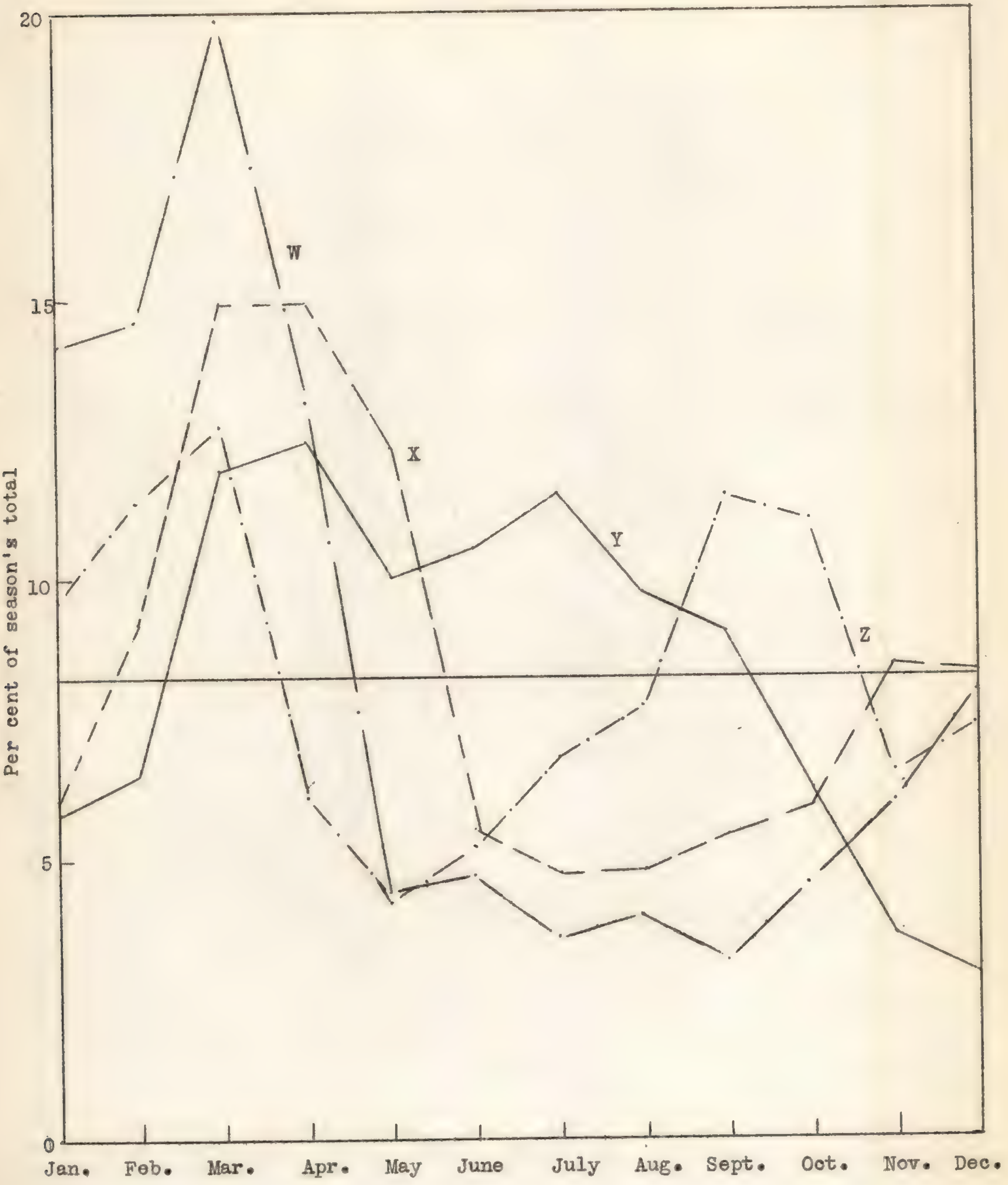
[11] "Maturity season" is used to designate the period within which the bulk of the fruit is picked. For most houses this will be a three-month period centered somewhere between February and June. The exact location of the period is largely the result of climatic conditions.

[12] See also: Wellman, H. R., and M. D. Street. Maintenance of substantial equity in the pooling of lemons. California Agr. Exp. Sta. Bul. 619:63. 1938.

Fig. 10.-- Seasonal Variation of Lemons Picked, 1935-36 Through 1939-40, for Four Packing Houses in Selected Areas



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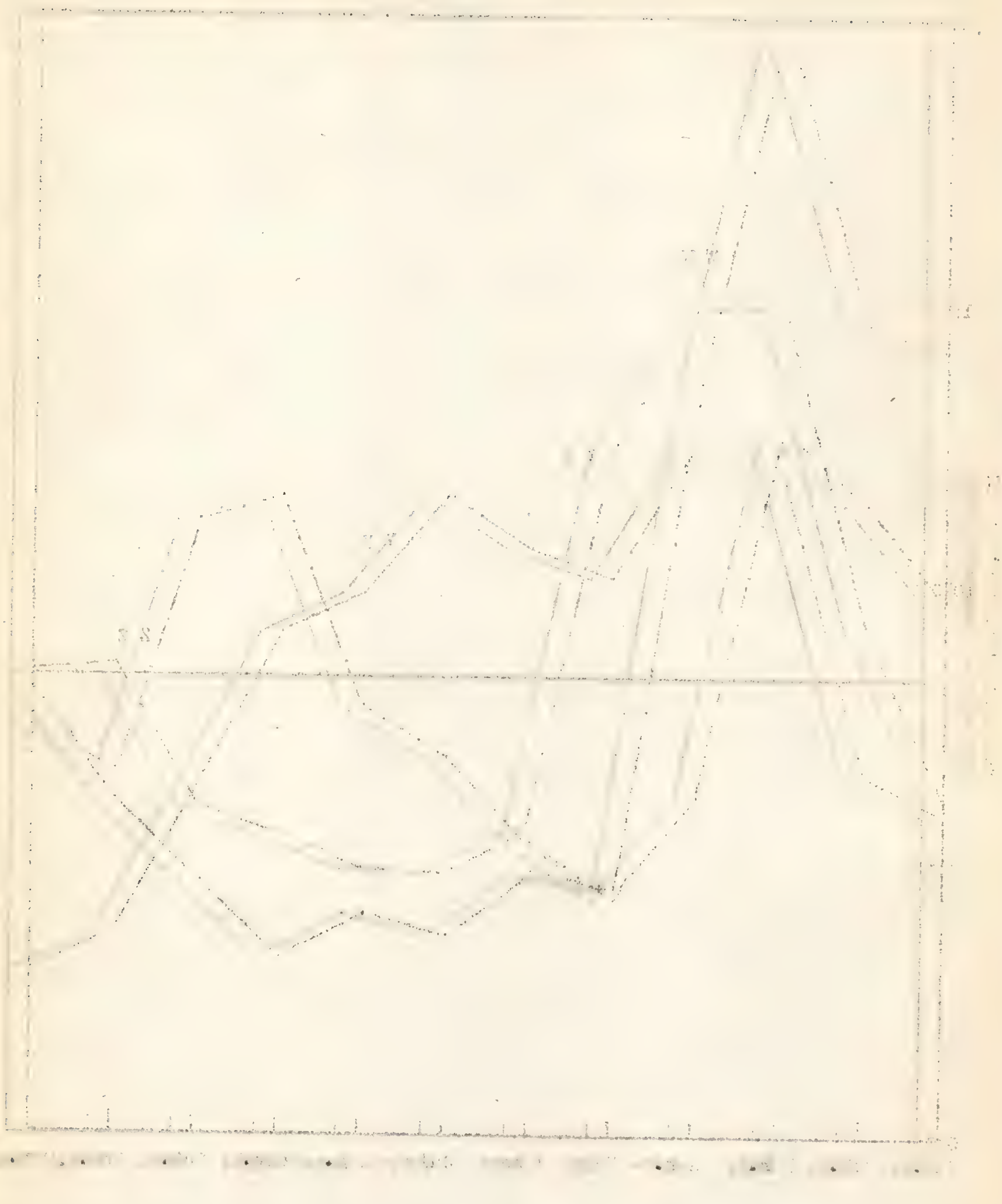

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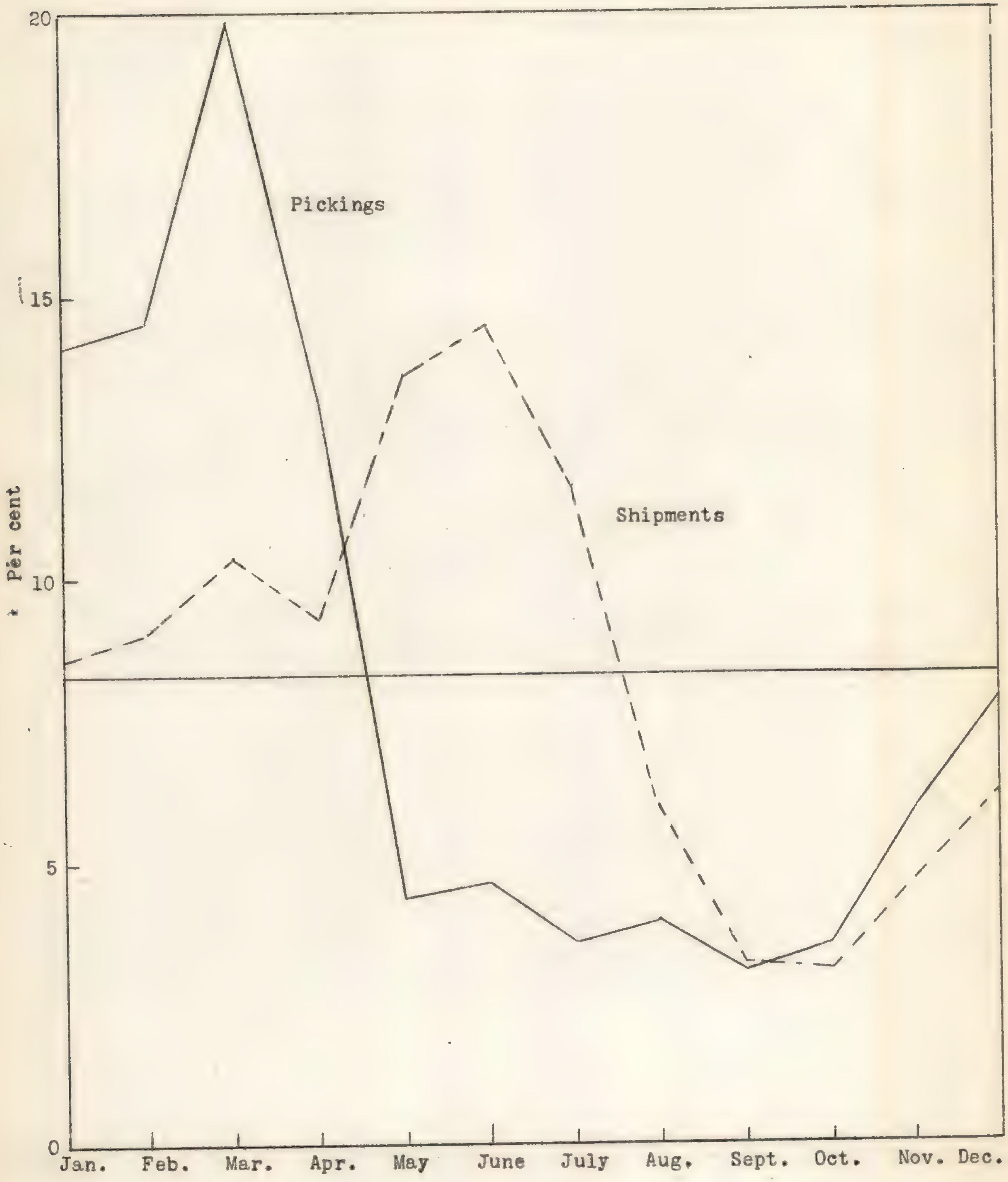
Fig. 11.-- W Lemon Association; Seasonal Variation of Lemons Picked and Lemons Shipped, 1935-36 to 1939-40



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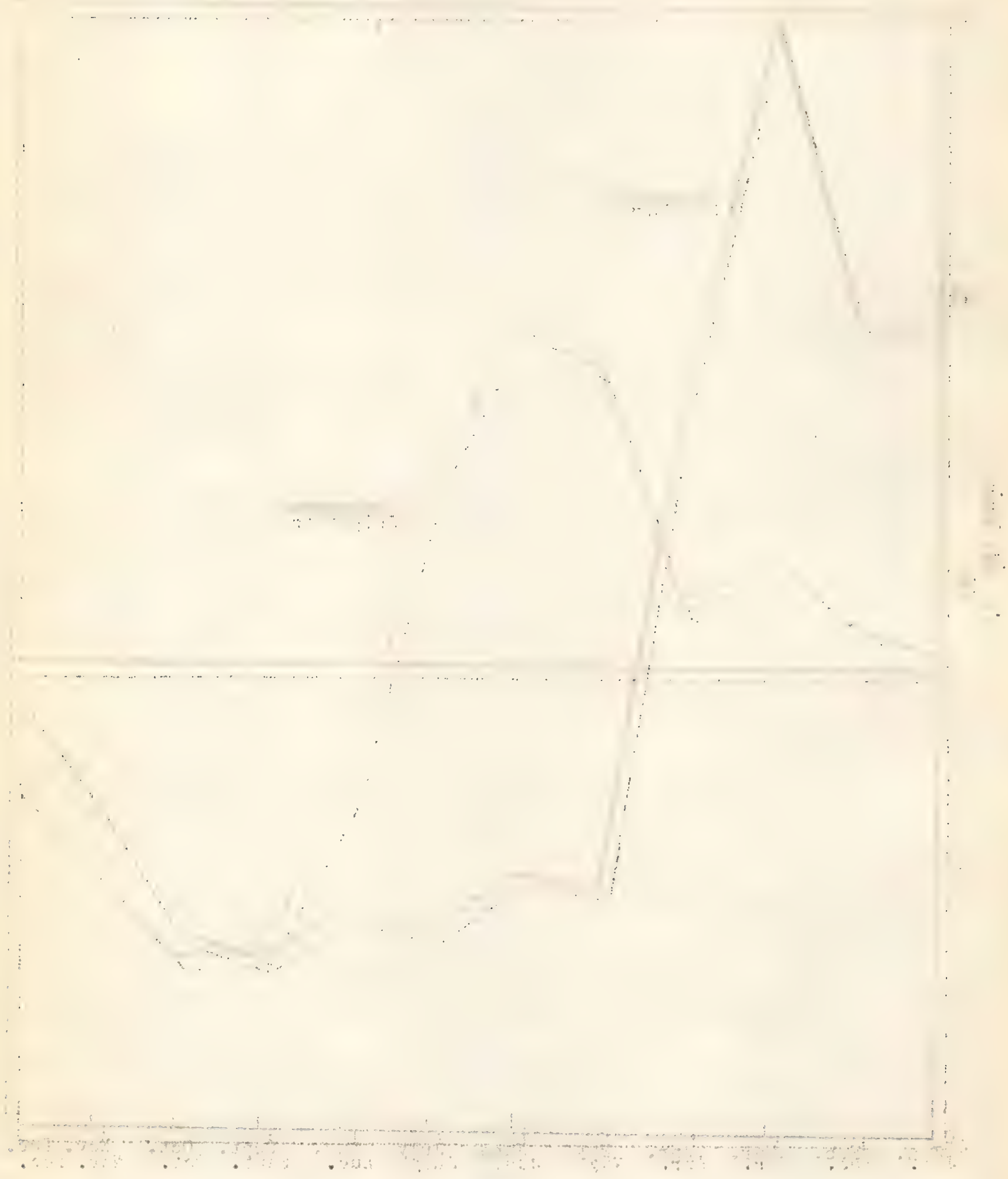

(3) Combination or "house" lots: [13] Of the eight houses included in this study, two combined small lots of fruit at the washer and credited each grower for the average grade-out on the basis of the number of field boxes contributed; five washed all lots separately regardless of size but combined small lots at the grading belts and credited each grower for the average grade-out on the basis of the number of storage boxes contributed; and one association washed, graded, and packed every lot of fruit separately.

(4) Elimination of by-products fruit at the washer: Table 10 shows that the amount of fruit eliminated at the washer varies from 6.8 per cent to 18.0 per cent of the total fruit received. This factor alone could hardly have an appreciable effect upon unit costs, but the elimination of all by-product fruit at the washer will certainly lower total handling costs. Where the amount of fruit produced is known to be far in excess of the amount which can be shipped under the prorate agreement, there is no reason why this excess fruit should not be sent directly to the by-products plant. Such a policy would eliminate all direct expenses (chiefly labor) incurred in storing and grading this fruit. If our fixed and variable classifications are reasonably correct, House X could reduce total expenses by $6,910 if all fruit destined for the by-products plant were eliminated at the washer. However, it would be unwise to attempt to eliminate at the washer all fruit ultimately destined for by-products. A margin of safety is required to enable the house to take advantage of changes in prorate allotments and to protect against losses due to extraordinary climatic conditions. Actual savings which could be realized by our typical house are, therefore, somewhat less than $6,910.

All packing-houses should analyze their own costs to determine which are fixed and which are variable, and this information should be used to formulate policy with respect to elimination at the washer. Attention should also be given to the possibility of reducing picking, transportation, and handling costs by sending a portion of the fruit direct from the orchards to the by-products plant.

(5) Care in handling fruit: While every manager should aim at reducing operating costs, there are occasions when increasing operating costs may be advantageous. This is especially true when a moderate increase in costs connected with the handling and preparation of fruit for market so enhances the quality and appearance of the fruit that such fruit brings in a higher return. Management must balance additional costs against additional returns. If the additional returns exceed the additional costs, then it is good managerial policy to incur them. For example, a manager may be able to obtain $1.60 per box f.o.b. packing-house for fruit handled in a certain way, packing-house expenses being 45 cents a box. If more care in packing fruit increases costs 3 cents a box to 48 cents, but the return f.o.b. packing-house is increased to $1.65, then the net benefit is 2 cents a box.

(6) Grades and sizes: Skill of management in choosing fruit for shipment will enable a house to earn a higher prorate and thus enable it to increase fresh fruit sales. Returns can also be influenced by the manner in which grades and sizes for shipment are selected. The pooling system has a bearing on this problem.

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[13] For a discussion of this practice and its relation to the pooling system, see: Wellman, H. R., and M. D. Street. Maintenance of substantial equity in the pooling of lemons. California Agr. Exp. Sta. Bul. 619:17-18. 1938.

Some associations, because of seasonality of receipts and shipments, are placed in the unfortunate position of having to ship fruit which has been kept in storage too long. Such fruit does not, therefore, have the quality which will ensure maximum market value.

Additional Data Needed.-- This preliminary study suffers from the grave defect that an insufficient number of houses were included to permit analyses of all the variable factors influencing returns and costs. Inclusion of a larger number of houses would make possible numerous cross tabulations and computations. Several houses should be included in each size bracket. All sections of the lemon-producing area should be represented by several houses.

If such a study could be continued over a period of several years, the analysis would tend to be even more valuable. Variations in the operations of individual houses owing to seasonal or other causes could be eliminated or provided for. It is quite possible that a house may have high unit operating costs and poor returns one year because of adverse weather conditions, whereas the next year, with more favorable conditions, costs may be reduced and returns increased.

One of the most important defects in the data obtained from the eight packing-houses was the inadequacy of physical data pertaining to (a) volume of fruit received, stored, dumped, sent to by-products, and sold loose or packed; (b) number of houses worked, and so on. Such data are indispensable in a study of plant operating efficiency. They enable the investigator (and would also aid the manager) to reduce costs to a unit basis for comparison and also help in explaining certain variations in costs. For example, it may be found that in House A, wages of 50 cents an hour are paid to packers, whereas in House B the wages are only 45 cents an hour. If data on number of hours worked were available, it would be possible to find out whether the packers in House A were more efficient than the packers in House B; that is, whether they packed more boxes per hour. If they did, it is quite possible that the unit cost per packed box for packing labor was no more in House A than in House B, although the hourly wages were higher.

During the course of this investigation, many hours were spent in each house in trying to obtain from the records adequate physical data. It is always difficult to extract such information months after the expenses were incurred. If such information were tabulated concurrently on a systematic basis, little additional cost to the plant would be involved.

The same criticism can be directed at the absence in most houses of any proper and logical departmentalization of operating expenses. For example, all packing-house labor is grouped in one general labor expense account. Many hours of work by the investigators were necessary in order to departmentalize the labor expense by functions. Even then, this could be done only approximately because officials of packing-houses were not always clear as to just what functions certain workers had performed months previously. The lack of departmentalization applies also to depreciation (of capital assets), insurance, repairs, and several other expense items.

The keeping of adequate physical data and the departmentalization of operating expenses would greatly facilitate an investigation of plant operating efficiency and also greatly reduce the time and expense incurred in making the investigation.

Uniform Accounting System.-- For an investigation of plant operating efficiency to be of maximum value to the lemon industry, it is highly desirable that individual houses adopt a uniform accounting system. If a larger number of houses kept their financial records on a uniform basis it would be possible for some agency, at little expense to the industry, to make yearly economic investigations. This would supply individual houses with reliable information which would permit comparisons with other houses and also comparisons of one year's operations with those of previous years. This type of analysis would be similar to that conducted by the Agricultural Extension Service and known as farm efficiency studies.

A uniform accounting system should embrace not only uniform account headings, but also uniform content of such accounts. Several of the houses included in this investigation had accounts with the same heading, but the items of expense included in such accounts often differed widely. In a few instances the item of expense included in a certain ledger account seemed to have little or no relation to the name of that account.

Other important requirements in a uniform accounting system would be uniform depreciation rates on different categories of capital assets, uniformity in the handling of repair expenses, and so on. Some houses charged repair expenses to a repair account, others to capital account. Where depreciation is figured on any basis other than the uniform rates agreed upon, the variation in rates should be shown so that allowance can be made by an investigator for such difference.

It follows that if a house adopts a uniform accounting system, the allocation and charging of expenses to various accounts should be in accordance with sound accounting procedure and not on the basis of whims and fancies of directors or perhaps managers who have only an imperfect knowledge of accounting procedure.

A course to instruct bookkeepers of lemon packing-houses in the principles and purposes of a uniform accounting system (after such a system has been developed) would be of considerable value to the industry. Similarly an arrangement whereby bookkeepers can be supplied with continuous advice on the handling of accounting problems which may arise from time to time would also be advisable.